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## The Development of Alfred Binet's Psychology

BY

EDITH J. VARON

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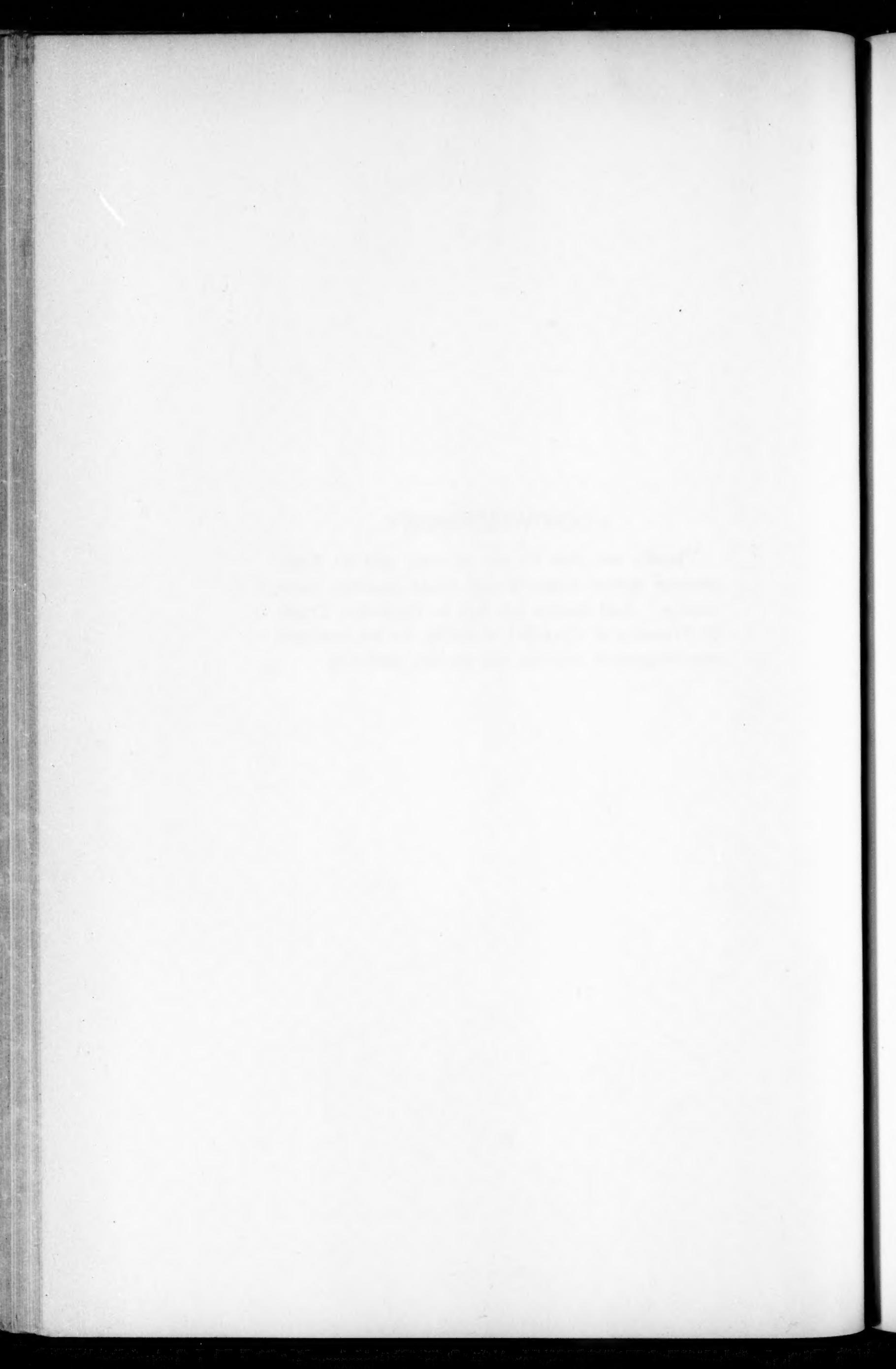
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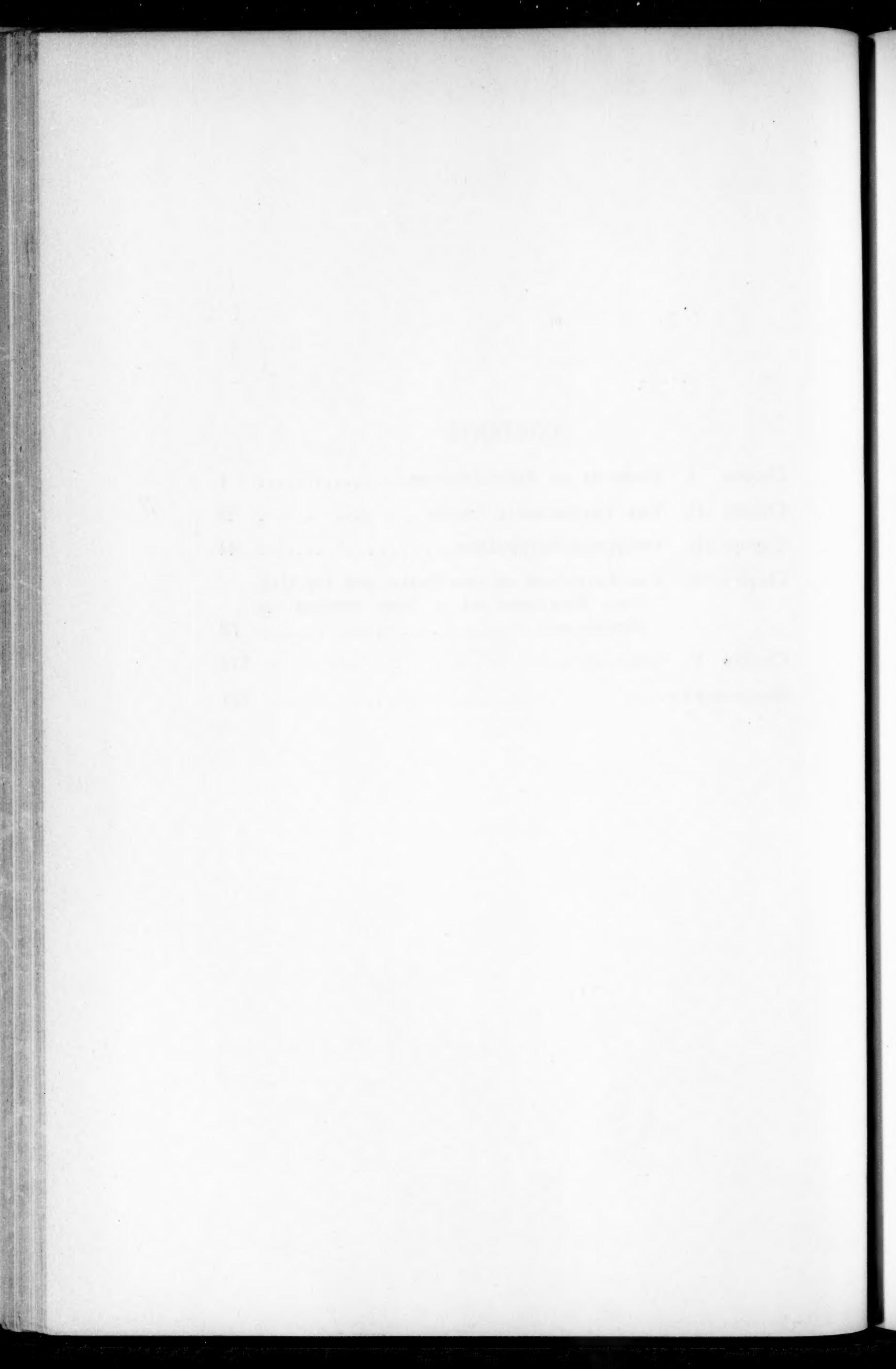
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## CHAPTER I

### BINET AS AN ASSOCIATIONIST

"The operations of the intelligence are only the diverse forms of the laws of association: it is to these laws that all psychology comes back, whether it appears simple or is recognized to be complex. Explanation in psychology, in its most scientific form, consists in showing that each mental fact is only a particular case of these general laws. As soon as this proof has been completed, one can consider the explanation as final, and as carried as far as it is possible to go; for the laws of association are the most general laws of psychology. They embrace all psychology, and there exists no superior principle under which one could include them. In applying these ideas to the subject which now occupies us, we come to say: to explain reasoning is to determine by what combination of the laws of association this mental operation took place; simple in appearance, it is in reality complex, and in the last analysis reducible to the two functions of resemblance and contiguity." ("Le raisonnement dans les perceptions," *Revue philosophique*, 1883, 15, p. 412.)<sup>1</sup>

For the young man who penned these lines, one concludes, psychology had reached a point comparable to that of physics at the time when it was thought that there was nothing left for the physicist to do but to calculate the next decimal. Psychology is now nothing but a kind of jugglery played with the laws of association. Potentially we have the answer to every question in psychology; it is only a matter of working it out.

That is the spirit in which Binet entered into the study of psychology. Clearly he at that time accepted *in toto* the sayings of the British associationists; he frequently shows through allusions that he was thoroughly familiar with Sully, John Stuart Mill, Lewes, and Bain.

He was twenty-three years old when he published his first article, and was then qualified through his studies to be, not a psychologist, but a lawyer. Soon psychology claimed him entirely, however, though he did later make a number of attempts to link psychology to the law.

The passage quoted above indicates that (though he was familiar with the experimental work carried on in Germany)

<sup>1</sup> Hereafter the *Revue philosophique* will be referred to simply as *R.P.*

Binet entered the field with a very narrow conception of what psychology should and would do; there were no fundamental new laws to be formulated, no altogether new phenomena to be discovered. Psychology was all theory, and no practical application. It explained more than it described. Experimentation was of minor importance. When experiments were performed, the laws of association were to intervene in the interpretation of the results. The major problem of the psychologist was to use ingenuity in applying the laws of association.

For all that, Binet immediately showed his own ingenuity and independence. In his first article ("De la fusion des sensations semblables," *R.P.*, 1880, 10, 284-294) he struck a fresh note by calling attention to the hitherto rather neglected law of *fusion*, in his attempt to explain, not why certain experiences are associated, or recalled together, but rather why sometimes, when we receive two sensations we perceive only one. In trying to explain the two-point limen by means of the law of fusion, Binet shifted the emphasis from explaining how a complex perception is built up from a number of simpler perceptions and sensations, to explaining how it may be that two sensations may yield a simpler perception, as of only one point. His proof runs thus: the tactile sensations coming from different parts of the body must be qualitatively different, one from another, because if they were not, we should be unable to tell what part of the body is being stimulated. Each tactile sensation bears its "local sign." But the sensations produced on the same part of the body are qualitatively similar; the local sign is about the same. And, as similar sensations or ideas tend to fuse into one, we perceive only one point, instead of the expected two.

In the course of the proof of this argument, it was of course necessary to disprove previous ones. In disposing of Weber's explanation, Binet displayed the blind ardor of a not too critical youthful enthusiast. Weber had proposed that a certain distance must intervene between the two points. But, says Binet,

" . . . as long as a unit (*ensemble*) of nerve fibers is not stimulated, it is for consciousness as though it did not exist. The fact is certain." (Binet, *loc. cit.*, p. 287.)

Without regard to the worth of Binet's theory, one may fairly point out that such a statement, unsupported by any evidence, is probably the result of an impetuous attempt to sweep aside all obstacles to the proof of his theory rather than of careful thought.

Three years later this same principle of fusion was again invoked to explain the absence of an experience which, on the face of things, we might be expected to have. Binet's first article had been on a relatively simple problem; but in his second one he plunged into one of the most difficult problems of psychology: that is, the explanation of how past experiences are added to immediate sensations, without our actually being aware of anything in the process except the final perception. (Binet, "Du raisonnement dans les perceptions," *R.P.*, 1883, 15, 406-432.)

Perception is always based on experience, for there is always more in the perception of an object than what is immediately given; *e.g.*, when seeing an orange, we see not only the circular orange color, but also its hardness, its juiciness, sweetness, etc. How do these impressions come to be added to the ones that are given? Binet supposes that the process is one similar to reasoning. Reasoning consists in the establishment of a relation between two terms; to reason is to unite. The problem here is to explain how the unification takes place.

Spencer had already pointed out that the syllogism is inadequate to represent the process of recognition. We might say, for example, that the recognition of a plane of cleavage in a crystal takes place as follows:

All crystals have a plane of cleavage;  
This is a crystal;  
Therefore, this has a plane of cleavage.

But the conclusion that 'this has a plane of cleavage' is already contained in the major premise, 'All crystals have a plane of cleavage;' and we must have recognized the plane of cleavage in the crystal before forming the syllogism. Spencer supposed that previous experiences relative to the cleavage of crystals determine us to think of the plane of cleavage of this one; but that these experiences do not present themselves to our minds before the affirmation of this particular case, although we may

be subsequently conscious of these experiences. Binet attempted an explanation of the intervening process, which Spencer had not provided.

Supposing, says Binet, we touch an object in the dark; then at first we do not recognize it, but after a moment the tactile sensations now received recall, by similarity, previous sensations of the same sort coming from this same object; but these sensations which have been recalled are tied, by contiguity, with other sensations of the size, shape, appearance of the object, and now these too are called up, so that we have a *perception* of the object which we have recognized in the dark. Ordinarily, when we perceive an object, the stimuli received likewise call up an intermediate state of consciousness consisting of similar experiences previously had; but by the law of fusion of similar sensations or ideas, these two states of consciousness fuse into one, and we are not conscious of the calling up of the second by the first. Thus it happens that recognition (perception) appears to us as something immediate and simple, although it stands to reason that it should be a complex process.

Having stated that perception is different from reasoning only in degree, Binet now justifies his contention. Perception contains the three terms necessary for a legitimate inference. The first impression is the minor term, the last is the major term, and the second one is the middle term. Not that the reasoning takes the form of a verbalized syllogism, for

"language is powerless to describe what happens in the reasoning by which a perception is formed. It is there . . . that one must seek the great difference which separates the logical reasonings from those which we derive from our sensations; the first can be expressed in the form of propositions, the second cannot." (Binet, *loc. cit.*, p. 430.)

Many things that we learn by experience cannot be stated linguistically, and indeed a syllogism would require information which the person does not always have: *e.g.*,

Every sensation situated on the right part of the retina corresponds to an object on the left.

This sensation which I receive is on the right.

Therefore it corresponds to an object situated on the left.

But most of us are not aware of these physiological facts, whereas we do have the experience necessary for inferring that the object is on the left.

In concluding this article, which is after all only a preliminary sketch, Binet proposes that the reasoning which occurs in perception is essentially the same as logical reasoning, for the function of reasoning is to unite, to establish a relationship between two terms, and that is what perception does. Reasoning, he says, "consists in the establishing of an association between two states of consciousness by means of an intermediate state of consciousness which resembles the first and is associated with the second." (Binet, *loc. cit.*, p. 432.)

Despite the apparent plausibility of the argument, there remained assumptions to be supported, and these furnished the subject matter for subsequent experiments and articles. In particular, it had to be shown that images actually do take part in perception as had here been stated. To establish this point Binet now wrote an article on the nature of hallucination ("L'Hallucination," *R.P.*, 1884, 17, 377-412). He defined hallucination as simply a pathological form of perception. Perception consists of sensations and something contributed by the perceiver, and is therefore psycho-sensorial. But the same is true of hallucination, for there is apparently always a sensation present on which the hallucination is based. For instance, in the case of auditory hallucinations, one can hear the patient uttering, deep in his throat, the words which he claims some outer voice is saying to him. And the images in perception and hallucination are similar not only in that they are attached to sensation, but also in that they are exteriorized and localized. Apparently because of association (that is the whole explanation offered) hallucination further resembles perception in that it may occur through a particular eye or ear, and in being subject to modification when the sensation which it is based on is modified.

These phenomena can be understood only if hallucination is explained as a pathological form of perception; but this definition must be proved by experiment as well as by theorizing. So the sequel to this article ("L'Hallucination," *R.P.*, 1884, 17, 473-

502) brought forth experimental evidence from the laboratories of the Salpêtrière for all that had been said. The subjects of the experiments, who were patients at the Salpêtrière, were hypnotized, and hallucinations were induced in them. By a number of devices the hallucination was shown to behave in the same way as a perception: In general, it disappeared when the eyes were closed, or when a screen was placed before the spot at which they were localized; hallucinations could be seen with either eye closed; they appeared double if pressure was applied to the eye, and were displaced if a prism was placed before the eye; they had the same spatial relations as a real object; they were affected by an opera glass in the same way as a real object. The difference between hallucination and perception seems to be that the image which is called up in perception is logically associated with the sensation to which it is attached, whereas in hallucination, where the image of a bird may be attached to a spot on the wall, association is obviously not logical. But even this difference does not prove that the two are distinct; for even in perception one sometimes finds, particularly when expecting something, that an unrelated image is attached to the sensation—one sees the person one expects, although one is looking at a stranger.

In addition to establishing the fundamental similarity between hallucination and perception, the article offers a classification of hallucinations as those having an objective cause, and which behave like perceptions; those of subjective cause, which fail to behave like ordinary perceptions; and those of central origin, which cannot be subjected to experimentation (as, those in delirium tremens). But on the whole the object of these papers is to justify Binet in using the evidence from hallucinations in talking about perceptions.

The next step in the marshaling of evidence was an article on psychic transfer (*R.P.*, 1885, 19, 1-25). Binet accepted and practiced the use of the magnet with hypnotized subjects; and though he used every means of keeping them in ignorance of what was the nature of the experiment, he nevertheless obtained most interesting results. For instance, in hemi-lethargy and hemi-catalepsy, the approach of the magnet (not visible to the

subject) caused a transfer from one side to the other. The suggestion was made to Witt that after awakening she should write numbers with her right hand; the magnet was near her left hand; she wrote twelve numbers with her right hand and then began using her left. Among these experiments were some that allowed Binet to say—which made his theory of reasoning that much more plausible, for it simplifies the explanation of how sensations come to be associated with images—that image and sensation have the same seat in the brain. Most of the proof of this point was culled from Fétré and others; but his own experiment, in which a suggested image caused pain in a part of the brain considered to be the seat of sensation, and in which this pain was transferred by the magnet to the corresponding part of the other half of the cerebrum, was of some importance in establishing it. The experiments here reported, however, had less than any of the previous ones to do with the proof of the theory. They mark the beginning of a second, and a more liberal study, which was brought together in *Le magnétisme animal*.

The final demonstration was of the possibility of exteriorizing associations as well as particular sensations or images. This had to be done, since Binet accepted the theory that all experience is a conglomeration of associations:

"The language which is used has the defect of making one consider an image as a *thing*, a *unity*. Yet reflection shows quite quickly that this pretended unity is composed of numerous and heterogeneous elements, that it is an association, a group, a fusion, a complex, a *multiplicity*." (Binet and Fétré, "Expériences d'hypnotisme sur les images associées," *R.P.*, 1885, 21, p. 159.)

He must show that not only the image called up by similarity would be experienced and exteriorized, but also those images associated with this one. In the case of hallucinations, one finds that if element *a* is called up, *b*, *c*, *d*, and *e* will follow; for instance, a young girl who had become insane after being raped constantly relived that experience, and each time she relived through the whole, in exactly the same way, and each part of the scene was reenacted at exactly the same point, in exactly the same way. In this unhappy hallucination, a number of associated images were exteriorized. For this reason,

". . . one can say that, if the image furnishes the *matter* of the hallucination, the associative bond gives it its *form*." (Binet and Fétré, *loc. cit.*, p. 162.)

The particular way in which the images were originally associated remains, and determines the final form of the hallucination. The immediate import of this for the theory of reasoning follows:

"Generalizing we can say that whenever images are associated, a judgment results. The judgment, according to Mill's analysis, affirms a relation of contiguity or of succession between two things; now, we have just seen that every association formed between two images has a tendency to be exteriorized, to appear real; this amounts to saying that the things bound together in the mind by a relation of contiguity or of succession appear bound together in the same way in the external world. Judgment is reduced to an exteriorization of images." (Binet and Féré, *loc. cit.*, p. 162.)

That is the conclusion toward which practically all Binet's work, since 1880, had tended. First he had proved that similar sensations are fused, and are therefore not perceived as distinct. Then he had pointed out that perception consists of sensations and images. Through experiment and theory he gained for himself the right to argue from hallucination to perception; and by experiments on hallucination he found that images have the same seat in the brain as do sensations, that images are exteriorized and otherwise behave as do sensations, that not only images associated to the present sensation are called up, but also series of images which are associated one with another.

All this makes it plausible that when a sensation is experienced, a similar image is called up from the same part of the brain; but the sensation and image, being similar, fuse into one. The image, although not recognized as such, calls up other images to which it is associated, and this association is also exteriorized in the perception. Thus we pass, by means of associated images, from the sensation of color to the recognition of an object, and to the judgment: "This is an orange."

All these arguments were brought together, as carefully ordered as an offensive array of pawns on a chess-board, and greatly elaborated, in *La psychologie du raisonnement* (1886). This careful order lends to the book a spurious air of inducing its conclusion from experimental results, whereas the history of it shows a strained effort to find in experiments as much evidence as possible to support what seemed to Binet like a foregone conclusion.

In the conclusion of the book there is added stress on the similarity between perceptive and logical reasoning. The reasons

given are essentially the same; they are sometimes not too cogent, as for example:

"Further, we have shown that a kind of filial relationship exists between perception and the reasonings of conscious logic. Thus, when we make systematized anesthesia, which has been developed in a patient relative to a certain person, gradually disappear, the thing which appears first of all is the perception of the person as a species; and it is only afterwards, by a kind of ascending evolution, that the recognition of the person as an individual takes place; now, we know that recognition is a complex operation which touches closely upon reasoning so called. All these reasons lead to the belief that perceptive reasoning and logical reasoning imply the same mechanisms." (*La psychologie du raisonnement*, translated by Adam Gowans White, p. 159.)

But this theory may be criticized for imposing on the mind certain limitations that do not seem to be there by nature. In the first place, it reduces all reasoning to the recognition of particulars, without explaining how it is that we jump from the particular to the universal. Then, because, like a good associationist, Binet extended his theory to include all psychology, he excluded from psychology whatever does not involve reasoning:

"All forms of mental activity are reducible to a single one—reasoning. The psychical life is a continual conclusion. . . . The mind, as Wundt said, is a thing which reasons." (Binet, *op. cit.*, p. 179.)

A further difficulty arose from the nature of his definition of mind (which is here synonymous with intelligence):

"The real foundation of reasoning must be sought in the psychical law which governs it. The organization of our intelligence is so arranged that when the premises of a reasoning are stated, the conclusion results from them with the necessity of a reflex action. In other words, we reason because we have in our brain a machine for reasoning. The legitimacy of our inferences has not a rational basis; it is not proved, for every demonstration presupposes the legitimacy of reasoning. This is a common sense truth." (Binet, *loc. cit.*, p. 181.)

This definition was open to the charge made against the associationistic doctrine as a whole, that of being too passive. Yet, despite having stated it in as mechanistic and passive a way as possible, Binet attempted a few pages further on to defend it from this charge:

"We leave to the reader the care of deciding whether this mechanical theory removes all activity from the mind, so as to reduce it to a purely passive state. This is a reproach which has often been made against the English school, which tries to explain all the phenomena of the mind by the laws of association. But to what extent is this reproach well founded? Images are not by any means dead and inert things; they have active properties; they attract each

other, become connected and fused together. It is wrong to make the image into a photographic stereotype, fixed and immutable. It is a living element, something which is born, something which transforms itself, and which grows like one of our nails or our hair. Mental activity results from the activity of images as the life of the hive results from the life of the bees, or, rather, as the life of an organism results from the life of its cells." (*Ibid.*, p. 187.)

But if one accepts the primacy of the laws of association, this defense is beside the point; conversely, if one accepts this view, that images are themselves dynamic, then the associative bond loses correspondingly in importance, and it becomes harder to accept the view that we think because we have in our brain a machine for thinking.

This book, Binet's first important work, brings to consummation the work of several years. At that time it did constitute an important contribution to associationistic psychology. The defect which undermines its value lies in the method of reasoning from conclusion to premises rather than from obtained experimental facts to a conclusion. This second method is the one which Binet employed in his later investigations into thought, and then, as is well known, he emerged with an entirely different view of the process.

The laws of association continued to play an important part in his investigations, but there is a change in tone which is first noticeable about this time. "La perception de l'étendue par l'oeil" (*R.P.*, 1886, 21, 113-121) was apparently designed, at first, to subject to experimentation the nativism-empiricism argument, and so, perhaps, find further substantiation for the associationists. The perception of space is here studied through the behavior of after-images. The peculiarity noted is that if one has the subject fixate three spots, thus obtaining three after-images at once, and projects these after-images on a movable screen, the distances between the spots will vary when the screen is moved back and forth; but the important fact to be noticed is that the spots always remain at the same relative distance from each other (*e.g.*, one spot is always three times as far away from a second spot as the second is from the third). On the other hand, if the subject does not fixate, but rather follows the contours of the figure presented to him, the after-image will be formless. It cannot be the movement that is responsible for the per-

ception of space, therefore. Binet, while declaring himself an empiricist, carries the discussion no farther; he finds it more important to stress

"the new element introduced into this debate by our study; in effect, the experiments on the after-image establish that the eye cannot perceive either directly or indirectly the *absolute* dimensions of the extent of a surface, and perhaps also of extent of depth; the eye grasps only relations." (Binet, *loc. cit.*, p. 121.)

A discreet silence follows. There is no attempt to explain the perception of relations by the laws of association.

Another attack on a fundamental problem of the associationists produced more positive results. "L'intensité des images mentales" (*R.P.*, 1887, 23, 473-497) opposes the doctrine of free will by showing how a person's opinions can be experimentally controlled. Our conviction of a truth varies with the intensity of the image, and by controlling this intensity it is possible to control a person's conviction. The intensity of an image can be increased by association by contiguity or similarity. If the subject is under hypnosis, the suggestion coming from the magnetizer may enhance the intensity of the image, by means of association by contiguity. If the experimenter performs the action the subject is to imitate, we have association by similarity, and this is more potent than association by contiguity (wherein the word alone suggests the idea); that is, it produces a more vivid image, the subject imitates more energetically. Association is rather obscurely described in this connection:

"The intensity of the suggested image is somehow related to the intensity of the suggestive impression, word, or gesture. The association of ideas becomes a regular *line of force*: one can compare it to a metallic thread which transmits the force of a magneto-electric motor." (Binet, *loc. cit.*, p. 476.)

One cannot tell, from the passage, whether this line of force operates between the experimenter and the subject, or between two images. Proper peripheral stimulation, also, and causing the subject's eyebrows to rise and come together will make the image more intense. On the other hand, the intensity of the image may likewise be reduced by corresponding methods. One may suggest to the hypnotized subject two contradictory ideas, and one of the images will vanish; one may convince him that he does not see something or someone; one may use peripheral stimulation

and the position of the eyebrows (which one paralyzes) in this negative way. Since, then, we can thus control the intensity of a person's images, it stands to reason that we can control his convictions—another argument in favor of the empiricists.

One phenomenon encountered in these studies led Binet to elaborate on the laws of association—not, as before, when he showed how the already accepted laws could combine, but in a rather daring new way. He found that if he rendered a subject deaf to the words 'book' and 'umbrella,' she not only ceased to hear the words, but also ceased to recognize the objects as such. Can it be, he asks,

"that when one paralyzes A, for example, a second idea B is afterwards found paralyzed? If this phenomenon were possible, one would find in it the corollary of the law of association of ideas according to which a certain idea A . . . being called up, a second idea B is consequently called up, by reason of the first. To the law of the excitation of one idea by another (popularly called the law of mental association) one could add the law of the paralysis of one idea by another." (Binet, *loc. cit.*, p. 490.)

Unfortunately he does not make clear what is an idea; sometimes he seems to mean the image of a single sensory impression, and at others he apparently means by 'idea' a whole complex of such impressions, linked by association. (E.g., the sound of the word 'book' is an idea, and the perception of the book is associated with this idea; but so is Mr. X—an idea; if he is rendered invisible, the sensations and images to which Mr. X—might give rise are all lost, and this is also one idea.)

The study of inhibition was continued in "L'Inhibition dans les phénomènes de conscience" (*R.P.*, 1890, 30, 136–156), which dealt with the nature of antagonism between states of consciousness, and attempted to explain by this means the nature of negation. One state of consciousness is suspended only after antagonism with another state, which supplants it. If someone tells us that there are books on the table, and we look at the table, and see that it is clear, then the second impression (which is a positive one) supplants the first, and we deny that there are books on the table. Furthermore, a systematized anesthesia produced under hypnosis is the result of a negation; but the negation results from a positive perception. Perhaps, therefore, the anesthesia is also something positive, and is the reverse side of hallucination.

(This idea was repudiated in *Le magnétisme animal*, on the ground that there is more to the anesthesia than the mere absence of a perception.)

An actual attempt to utilize the theory of inhibition was made in "Sur un cas d'inhibition psychique" (*R.P.*, 1891, 32, p. 622). The instance is the interpretation of a picture. If an extremely surly mouth is drawn in an otherwise laughing face, the picture appears cross. If the mouth smiles, suddenly all the other features appear to be amiable, although they remain unchanged. The explanation given is that the laughter of the eyes is contradicted by the expression of the mouth, and so one perception suppresses the other.

"La vie psychique des micro-organismes" (*R.P.*, 1887, 24, 449-489, and 582-611) likewise shows Binet moving with much greater freedom within the domain of associationism, and possibly coming near to the borderline beyond which the laws of association are inadequate. The psychic life of microorganisms is defined, not in terms of association, but as "their life of relations."

"The life of relation includes essentially two terms, the action of the external world felt by the organism, or sensibility; and on the other hand, the reaction of the organism on the external world, or movement." (Binet, *loc. cit.*, p. 449.)

The purpose of the book is to show that microorganisms have a complex psychic life, and favors a vitalistic psychology more than strict associationism would seem to allow.

"In admitting then that irritability is the foundation of psychology, we must nevertheless guard against comparing the autonomous cell of microorganisms to a simple irritable cell. Although the body of these small beings may be equivalent to a simple cell, it would be an error to believe that their life of relation consists in a motory reaction consequent upon exterior irritation. At the close of our investigations into the psychology of protoorganisms we shall see that, in these inferior beings which represent the simplest forms of life, we find manifestations of an intelligence which transcends the phenomena of cellular irritability. Thus, even on the very lowest rounds of the ladder of life, psychic manifestations are very much more complex than is usually believed, and the conception of cellular psychology which some very recent authors have formed, seems to me a very crude analysis of the most delicate phenomena." (Binet, *op. cit.*, translated by Thomas MacCormack, p. 3.)

The psychic life is described through the 'life of relations' as defined above. There are descriptions of the usual reactions of microorganisms, particularly of those which have sense-organs.

Their reproductive life is described in careful detail, and an analogy is drawn between it and the reproductive life of higher organisms. Yet, in his attempt to refute those who explain the life of microorganisms entirely by the laws of irritability, he rests his case solely upon the fact that these organisms exercise choice in nutrition: some food is ingested and other food is rejected. He fails to consider the possibility that some food may irritate the animal in one way, causing ingestion, while other food irritates it in another way, causing rejection. His thesis remains unproven, despite the interesting content of the book.

At the same time (*R.P.*, 1887, 24, 142-167 and 252-274) there appeared a study of fetishism in love, which is noteworthy as being Binet's only excursion into the realm of the abnormal at this time. Although he worked during all this time with abnormal (hysterical) subjects, he aimed to study the phenomena of the normal mind through the abnormal (who have the redeeming quality of lending themselves better to some studies than do normal persons). The present study, however, is not the product of the Salpêtrière nor of any laboratory; it is merely a description of numerous cases of fetishism, ranging in degree from that of Descartes, who preferred cross-eyed women, to that of the man whose sexual desire was aroused by the sight of a white apron drying in the sun. The fetish, he concludes, is a distortion of the normal state; normal love is a synthesis of innumerable fetishes:

"Thus one might say that in normal love the fetishism is polytheistic: it results, not from a single excitation, but from a myriad of sensations; it is a symphony. Where does pathology begin? It is at the moment when the love for some detail or other becomes preponderating to the point of obliterating all others." (*Binet, loc. cit.*, p. 274.)

Although it still assumes that psychic phenomena are additive, that a complex idea or feeling is produced, for instance, by the synthesis of a number of simple images (an idea which was later abandoned) the laws of association are not made to intervene in the explanation. The trend is distinctly away from that.

*Le magnétisme animal* (with Fétré) shows clearly the profound disturbance bound to occur in a classical psychologist who has gone to work with abnormal subjects. Hypnotism, it is true,

may come under the head of normal phenomena, but it had been ignored by classical psychology, which would have found it hard to explain some of the strange phenomena occurring under hypnosis. Possibly the laws of association could have been so manipulated as to do this, but the explanation would have been far-fetched, and none too plausible. In this book, therefore, Binet, on the one hand, clings as loyally as ever to the laws of association, and, on the other, points insistently to their inadequacy; and the result is that he is sometimes using them as explanation, and at other times not, although the phenomena which he does explain by association are not altogether distinct from those for which he has no explanation.

This vacillation and lack of consistency is something quite new: compare it with the dogmatic certainty of *La psychologie du raisonnement*. The empirical approach is also rather new; the form of the book is more that of a handbook than of a thesis. A good portion of it is devoted to the history of hypnosis (animal magnetism), and to the modes of producing it, the symptoms, and the characteristic states, all this being brought together from a number of sources. It is not until he comes to the chapter on suggestion (p. 171) that Binet introduces himself into the picture.

It is in the study of suggestion that the psychologist runs up against difficulties. He might simply report the peculiar results that may be obtained with hypnotized subjects, but he will never fully understand what has been going on in the subject unless he understands the nature of suggestion, what it is, how it works. It is impossible, moreover, to study suggestion without running into the mind-body problem.

The following definition is the first one offered, but it is not strictly adhered to in subsequent pages:

"Suggestion is an operation producing a given effect on a subject by acting on his intelligence. Every suggestion essentially consists in acting on a person by means of an idea; every effect suggested is the result of ideation, but it must be added that the idea is an epi-phenomenon; taken by itself it is only the indicative sign of a certain physiological process, solely capable of producing a material physiological effect." (Binet, *loc. cit.*, p. 173.)

"What is meant by an idea? . . . The idea resolves itself into an image, and the image into a revival of sensation. It consists in the psychical renewal

of a peripheral sensation ordinarily experienced by the subject. This enables us to understand its power; the idea is, strictly speaking, only an appearance, but there lurks behind it the energy excited by a physical, anterior excitement." (*Ibid.*, p. 184.)

This all takes place by the association of ideas; the experimenter's words arouse, for instance, the image of a bird, and a hallucination is the effect. This is all very well, but it is possible to suggest not only hallucinations and movements, but also acts, and these, according to Binet, are not so easily explained.

"Admitting that the suggestion of a movement is explained by the association of the movement with its image or representation, it is a question whether as much can be said of the suggestion of an act. When the subject's brain is charged with the idea, 'On awaking you will steal the handkerchief of some given person,' and the subject when he awakes does actually commit the theft, we cannot suppose that there is nothing in this except an image associated with an act. The subject has, in fact, appropriated and assimilated the experimenter's idea." (*Ibid.*, p. 204.)

A further difficulty occurs when suggestion renders some present object or person invisible to the subject; the laws of association are here still less useful:

". . . it cannot be said that the incapacity for seeing M. X—, who is present at the time, is . . . associated with the words, 'M. X— is non-existent.' It is necessary, in order that a given object become invisible, that the subject first perceive it, and recognize it as the object which is not to be seen. Furthermore, there are hallucinations of the objects which would naturally be hidden by the now invisible object.

"In this case the law of association, which is so useful in resolving psychological problems, is altogether unavailing. This is probably because this law will not explain all the facts of consciousness, and is less general than it is supposed by the English psychologists." (Binet, *loc. cit.*, p. 204.)

What has occurred between the spoken word and the resultant anesthesia is unknown, and this intermediate process is the psychologist's real problem. The question is only raised; there is no positive hint of how it can be answered.

The inconsistency of which Binet is guilty lies in opposing acts to hallucinations. He does state explicitly that active phenomena—the suggestion of hallucinations, etc., must be opposed to passive phenomena—the suggestion of paralysis, etc. But acts and hallucinations both fall in the class of active phenomena. The relation between them is very close, for a somnambulist subject has a hallucination which arouses a memory, he relives the memory, performing the old acts over again. Yet this is

attributed to the association of ideas, although that is supposedly an inadequate explanation for the suggestion of acts. This study of suggestion is helpful only in so far as it brings out problems.

The discussion passes from the process of suggesting to the suggested state, and faithfully recounts how hallucinations may be produced in the several senses, how movements and acts, and how also paralyses and anesthesias (which somewhat resemble amnesias) may be suggested. A great deal of this part of the book is derived from previous work by Fétré; when it comes to the action of esthesiogens on these suggested states, it is based on experiments which the two had performed together and which had earlier been reported in the *Revue philosophique*.

They armed themselves against the suspicion that their results with the magnet might be due to suggestion by the following arguments: The researches were new to them, and they could not foresee the results; the same results were obtained with fresh subjects, and also with the magnet made invisible, but not with a wooden block substituted for the magnet. The results were of two kinds, depending on whether the suggested state was symmetrical on both sides of the body. If it was not, transfer occurred at the approach of the magnet, otherwise polarization. In transfer, the movement or position would pass from one side of the body to the other, to the accompaniment of pains in the head. Both movement and pain oscillated back and forth from side to side, a number of times. Polarization occurred when the position of the suggested state was symmetrical: e.g., in emotions, or in the case of binocular hallucinations. Polarization consists in a suppression of the existing state, a paralysis, and the appearance of the antagonistic state. Thus, a person to whom it has been suggested that she cannot twirl her thumbs will be unable to do so, but at the approach of the magnet the subject passes through the preliminary stages and then starts twirling them. One subject was told that on awaking she would feel the desire to strike F—— with her foot; and a magnet was placed near her foot. When she awoke, she tried first to slap him, then to embrace him; there was oscillation here as in the case of transfer. A number of such experiments with polarization of emotions

convinced the authors that there are complementary emotions, just as there are complementary colors. These two phenomena are treated as though of interest and importance, yet their study was dropped after the publication of the book.

The phenomena of paralysis and anesthesia are separately treated, as opposed to the more active phenomena which precede them. An anesthesia to an object, like a hallucination, may be produced in any of the sense modalities; it will be systematic, that is, it will exist with reference to a specific object. It may entail a loss of memory concerning that object, thus creating further problems in connection with the laws of association—the answer to which problems is not given. It has already been pointed out that being anesthetic to an object requires that one first perceive it, in order to recognize that that is the object to which one is to be anesthetic. Furthermore, if the subject is anesthetic to the sight of another person, she may remain sensible to touch by that person, and must account in some way for these sensations received from an invisible object. They may be said to be cramps or itches, which could occur spontaneously; but the question remains, How does the subject happen to supply this answer?

There are three grades of paralysis: total paralysis; aboulia, or the inability to make up one's mind to perform an action; and systematic paralysis, or the inability to perform certain actions. The first two are more complex than the last, according to the authors. In this one sees that explanation by the laws of association has been virtually discarded, since it is opposed to the spirit of these laws to aver that the inability to perform one action is something more complex than inability to perform all actions; if one accepts the laws of association, one supposes that the multitude of actions which a person is capable of performing is not a unity, but a conglomeration; and it should be simpler for one action to drop out than for the whole mass to be lost. Yet it is said that

"Systematic paralysis . . . consists in a disturbance of motor coördination; it does not affect movements, but the association of movements; it dissociates the movements which were originally associated." (Binet and Féré, *loc. cit.*, p. 339.)

*Le magnétisme animal* contains information useful to a person totally ignorant of hypnosis; but its theoretical content is too incoherent and lacking in clarity to be of value.

The following quotation should be noted, however, since it gives one of Binet's earliest statements concerning intelligence, and also some idea of the course which he would have described for psychology:

"We are now aware that it [suggestion] may affect all the parts of the psychical mechanism, sensation, imagination, memory, reason, will, motor power, etc.; it is, in a word, coextensive with intelligence. Classical psychology, which does not mention psychical paralysis, omits half the history of the mind: it describes the active, impulsive forms of intelligence, without taking note of the passive, negative forms, which are equally numerous; it reports that side of the mind on which the light falls, without taking note of the side in shadow." (*Ibid.*, p. 304.)

This almost amounts to saying that general psychology must proceed in collaboration with the psychology of the abnormal, and one might reasonably suppose that this is what Binet intended to do.

The study of the "part of the mind which is in shadow" did in fact lead to another book, *Les altérations de la personnalité* (1892), which, in the form of a handbook on alterations of personality, attempts to answer the more important questions raised by *Le magnétisme animal*. It is a much more systematic book, much more clear and convincing. The facts are lined up, and are interpreted without equivocation or quibbling. The aim of the book is to show how a subject may at the same time see and yet not see an object. The hypothesis of a doubling of personality is offered for this and other phenomena of the same kind.

Somnambulism furnishes the starting point of the demonstration. There are individuals who have two, or even more personalities; and in one of these personalities, it may be, they remember everything that has ever happened to them, but in a second personality they remember only those things which have happened while they were in this state. In this case, there is a kind of splitting of consciousness; certain memories are entirely cut off, although they remain there in a latent state and will come back when the personality has changed once more.

Somnambulism may be induced in a hypnotized subject by

suggestion, and will show the same characteristics. That is, the hypnotized person in the somnambulistic state remembers even more than he does in his normal conscious state; but when he awakes, he remembers nothing of what has happened while he was in the somnambulistic state. Thus the somnambulistic state is entitled to be considered as a second personality, for personality is analyzed into two elements, memory and character; and although character is not markedly modified in this state, the memory is. But the phenomena of post-hypnotic suggestion demonstrate a curious coöperation of the two personalities, or consciousnesses. After waking the subject performs the act which she had been told to do, yet has no memory of the state in which she was given the order, or of the order itself; she therefore gives some entirely different reason for performing the act. The real reason for performing it is in one state of consciousness, the somnambulistic, and the ostensible reason is supplied by the normal state.

The personalities in somnambulists exist alternately, but in hysterical patients it may be shown that there are two coexisting personalities, and these personalities may also be shown to coöperate. If, for instance, a hysterical person has an anesthetic hand, and this hand is hidden behind a screen, and the experimenter impresses some movement upon it (such as the bending of the fingers) this movement will continue even after the experimenter's hand is withdrawn. The subject claims, however, to know nothing of what her hand is doing. If the hand is pricked, the subject will not feel the pain, but will have visual images amounting almost to hallucinations, of points or bars—in this way one can even find the two-point limen on the anesthetic member. The hand can be made, also, to write unconsciously. From all this it is apparent that, although the skin seems to be anesthetic, impressions are received, and so this anesthesia may be called "*anesthesia from lack of consciousness.*" (Binet, *op. cit.*, translated by Helen G. Baldwin, p. 129.) The fact that one can demonstrate that these sensations are received, however, indicates that they are connected with a consciousness which is not the main one.

Even with normal persons, or with persons who tend to be hysterical but are in their normal state, one can easily obtain signs of multiple consciousnesses. When a person is attending entirely to one thing, this attention carries in its train a consequent distraction for other things. During this state of distraction it is possible for the experimenter to communicate with a second personality in the subject. He may ask questions, and receive replies, without the main personality's being aware of either. This is of course very difficult with normal persons, but with hysterical subjects one may even go so far as to suggest acts (*e.g.*, to fetch a glass of water) which will be performed, and still the main personality will remain in ignorance of the fact. These experiments lead to the conclusion that this subconscious is identical with the somnambulistic consciousness; it is a part of the somnambulistic life that survives in the waking state.

In certain actions the coöperation of the two consciousnesses may be very prettily shown. If a hysterical person is asked to write with an anesthetic hand, for instance, while her eyes are closed, she will do so. Most of these patients declare that they do not know that they are writing, but they have visual images of themselves writing. Physiologically, also, the movements of an anesthetic member give signs of divisions of consciousness. For instance, the consciousness involved is so contracted that there is no experience of fatigue. Automatic handwriting gives still further evidence of coöperation: the hand may write the very word of which the subject is thinking, or make five strokes if she is thinking of the number five.

It has already been pointed out that sensations received by the anesthetic limb may not be experienced as such, but may nevertheless enter into the normal consciousness of the subject. A remarkable instance is that of the hysterical girl on whose neck Binet placed a medallion with the figure of a pig in relief on it. The girl, although she had no tactal sensations, had visual images amounting almost to hallucinations of the coin, and was able to draw a fairly good reproduction of the pig. (A normal person receives no impression except that of a round object.)

Unconscious movements give evidence of the plurality of con-

sciousnesses in healthy subjects, as when the person thinks he holds his hand perfectly steady, but causes the divining rod to tremble over certain substances and to remain quiet over others. With the proper experimental set-up a normal person may be made to write automatically while engrossed in talking or reading, and this writing also demonstrates a plurality of consciousnesses.

Under the head of "Alterations of personality in experiments on suggestion" are discussed some of the topics of *Le magnétisme animal*: the creation of artificial personalities by suggestion, the revival of former states, also by suggestion, suggested acts and hallucinations, and systematized anesthesia. But there is here no shilly-shallying about the laws of association. It is boldly stated that they are inadequate to explain these phenomena, which must be attributed to divisions of consciousness. The reliving of an experience had been attributed to association, but here

"The laws of the association of ideas, which have been so much used and even abused in the hands of the English psychologists in the attempts to explain many phenomena of the mind, are ineffectual in these cases. They do not teach us why and how memories that are retained fail to revive at the call of new impressions that are associated with them. A particular event of childhood, which no longer comes up in the mind, may yet be recalled by retroactive suggestion. This memory certainly has not lacked opportunities in the course of the normal life of rising again to the surface of consciousness. A great many similar events have happened since. If, therefore, there is no response to this tie of resemblance, it must be because the play of association of ideas is not strong enough to arouse it, and association is therefore not sufficient to explain the development of the mental life. Undoubtedly something else besides these slight bonds is necessary to connect our ideas. More profound causes, whose nature it is difficult to determine, just because they are unconscious, operate to apportion our ideas, perceptions, memories, and all our conscious states into free and independent syntheses. When we are in one of these syntheses we have difficulty in arousing an idea which belongs to a different synthesis. In general, association of ideas is not enough; but when some elements of this second synthesis have once been revived for one reason or another, then the entire synthesis reappears." (Binet, *loc. cit.* pp. 269-270.)

In other words, associationism assumes that memory is fundamental to all else in psychology, but the peculiar action of memory in the division of consciousness indicates that it is itself controlled by something more fundamental still. And this something is not conscious. (The importance of the unconscious reappears in Binet's last theoretical writings in 1911.)

The evidence accumulated concerning the division of consciousness in normal and hysterical persons, with and without sugges-

tion, leads to a revision of the conception of consciousness and its laws. Concerning consciousness there are three new propositions:

"1. Elements that enter normally into the constitution of our ego may fall into a state of disaggregation.

"2. A consciousness never ceases to accompany these elements, although the ego loses consciousness of it.

"3. Sometimes, under exceptional conditions, pathological or experimental, these elements are organized into secondary personalities." (Binet, *op. cit.*, p. 348.)

These propositions necessitate a redefinition of the unity of the ego. Obviously association fails to explain it, since an object that suggests a series of memories in one state may fail to suggest anything in the second state; yet the object is the same in both cases, and the memories are still there, for they will be called up again if one returns to the first state. One must look elsewhere for the unity of the ego.

Furthermore, the ego must be made up of parts, for whatever "is capable of division must be made up of parts."

"The unity of our adult and normal personality clearly exists, and no one doubts its reality; but there are pathological facts which prove that this unity is to be sought in the coördination of the elements which compose it." (Binet, *loc. cit.*, p. 350.)

Finally, these facts concerning consciousness indicate that the limits of consciousness cannot be known. What is not conscious in one state may be so in another, and we do not know to what psychical processes consciousness attaches.

*Les altérations de la personnalité*, by thus completely rejecting associationism and refusing to accept classical beliefs, marks the end of a period in Binet's career as a psychologist. It does fulfill, also, his promise to continue to study the part of the mind which is "in shadow;" and it does answer certain questions of fundamental importance. On the whole, however, it is not a constructive book, in that it does not lead on to new investigations. It does not tell how the study of psychology is to be continued through the study of the abnormal. And when a program for psychology was drawn up, the abnormal was left entirely out of it. How this came about will be shown in the next chapter.

From 1880 to 1890 or thereabouts Binet definitely adhered to the associationist psychology. At first he was impelled by the

blind enthusiasm of a disciple; then gradually, as he began to examine the facts more coolly he ceased interpreting them so that they would fit the theory. About the time of the publication of *Le magnétisme animal*, in fact, he began to criticize the theory by the light of experimental data. This first and most important change in his "scientific attitude" led him to criticize the theory of association to the extent that he finally discarded it altogether. Thus he entered upon a second period of his career with an interest in scientific facts, but without a theory which would enable him immediately to explain them. This lack of 'open sesame' constrained him to greater caution and judiciousness.

## CHAPTER II

### THE TRANSITIONAL PERIOD

At the same time that the atmosphere of the Salp ti re was leading Binet to appreciate the advantages for psychology of working with the abnormal, another laboratory was providing him with excellent material, always accessible, and demonstrating the advantages of other modes of investigation. The fact that Binet was married and had two daughters seems really to be a matter of some moment for psychology. The researches reported in the first chapter form a closed chapter. Except in so far as they led to a repudiation of associationism, and as they gave Binet plenty of practice in experimentation, they did not affect the course of his later work. Gradually the interest in abstruse philosophical questions waned, along with the tendency to form theories first and prove them afterwards. All that belongs to the first period of work with hysterical patients. The observation of his own children, on the other hand, stands at the head of a series of kindred researches. It is the source of the problem which, in turn, led to Binet's greatest contributions to psychology.

The observation of his children began in 1890, when he was still at the Salp ti re, when he reported on "Recherches sur les mouvements chez quelques jeunes enfants (*R.P.*, 1890, 29, 297-309). As the title indicates, this was a plunge into an entirely new type of research. He sketches the development of movement in children from infancy to the time when they learn to walk. But he does not do so without becoming involved in questions of instinctive behavior (his theory being that walking is instinctive) and of individual differences. He reported also the differences in the way in which his two daughters learned to walk: one would always hold to a post, and look for another to which to go; she walked at twelve months; the other daughter paid no such heed to what she was doing, but walked in the empty room and tumbled down when she had nothing to hold on to, and she walked

only at fifteen months. These differences in learning to walk were consistent with the personalities of the two girls, for the younger one was always more easily distracted.

In fact, the personality of the child receives even more detailed attention than this. It is pointed out that the peculiar characteristic of the child's mind is

"a tendency to mental lack of cohesion (*desagrégation*) which simply proves that the systematization of the intellectual elements which characterizes the healthy adult has not yet been made." (Binet, *loc. cit.*, p. 304.)

By this he means that a child passes from one mood to another, from laughter to tears and back again, without passing through intermediate stages. The child is very easily distracted. So, in this article on movements, one finds the study of development, of the mental organization characteristic of a particular age, and of individual differences, all suggested; and these are among the main problems with which Binet dealt for the next twenty years. The idea of measuring intelligence, it is true, is not suggested in this article; it appears only in the next one.

One would hardly expect an investigation into a child's ability to judge lengths to yield anything very unusual; but in the second report on experiments with his children, Binet found opportunity to follow up the study of development, and to indicate the direction which some of his later investigations of intelligence would take.

One of the experiments set up two semi-circles, on which were marked off sectors, and the subject of the experiment had to judge which of the sectors was the larger. Madeleine, age 4-3, could perceive the difference between  $40^\circ$  and  $43^\circ$ , whereas an adult can differentiate between  $40^\circ$  and  $42^\circ$ . But the difference between these two ratios is really not valid for indicating the difference between child and adult; it would be necessary to experiment with the same individual at different times during his development in order to see how his judgment changes with age. This, of course, is not yet practicable (in 1890), and in the meantime it is necessary to be content with the comparison of average figures, and such a comparison is of some value in the study of differences in intelligence:

"Until I can make this comparison, I take the average figure for the adult, which is equal to 2/40 of the smaller angle, and it is to this average figure that I allow myself to compare the result of the experiments, which I have just summarized. But it is evident that the difference between 2/40 and 3/40 is altogether minimal, and that it could not express in any way the relation which exists between the intelligence of an adult and that of a child. In the event that one should succeed in measuring intelligence, that is to say reasoning, judgment, memory, the power of abstraction, which does not appear to me to be altogether impossible, the figure which expressed the average intellectual development of an adult would present an altogether different relation to the figure expressing the intellectual development of the child." (Binet, "La perception des longueurs et des nombres chez quelques petites enfants." *R.P.*, 1890, 30, 68-81, p. 74.)

One may remark in passing that there is nothing either new or remarkable about the definition of intelligence in this passage. In both *Le magnétisme animal* and *Les altérations de la personnalité* he refers to it in a similar manner. He apparently meant by intelligence about the same as Taine (whom he greatly admired) meant. Taine defined it as

"what was formerly called Understanding or Intellect—that is to say, the faculty of knowing." (H. Taine, *On Intelligence*, translated by T. D. Haye, 1884, p. vii.)

It is something very general and vague, running through all conscious psychical phenomena, but not in itself a faculty or function. A more precise definition had not yet appeared to Binet to be necessary.

The comparison of a particular function with itself at different times would give an idea of individual differences due to growth, but not all functions can be so used at all times. Since perception is so highly developed in a young child, it is hardly likely that one could gain as much knowledge about the child's development through that function as through some other which is still in the process of developing. The study of the intelligence of a very young child would involve the study of lower functions than it would in the case of an older child:

"I limit myself to pointing out the interest which there would be in knowing whether, as my observations seem to show, intellectual development begins with the lower functions, which may attain a very high level and almost complete their evolution at a time when the higher functions are in an almost rudimentary state." (Binet, *loc. cit.*, p. 75.)

Differences between individuals can be more easily perceived if they are compared with respect to some faculty which is still

in the process of developing, on the same principle as that on which we now consider that a test is better suited to distinguish between two individuals if it is beyond the ability of either of them entirely to complete it.

This article also reported the ability of children to perceive numbers. It appeared that though a child cannot count beyond three, it can nevertheless perceive differences between larger numbers, as between two piles of fifteen and eighteen objects, respectively. The explanation of this judgment is found, not in the actual numbers involved, but in the space occupied by each pile. If one uses chips, and the white chips in one pile are four cm. in diameter, whereas the green chips in the other pile are only two and one-half cm. in diameter, then ten of the white chips will seem to the child to be more in number than eighteen of the green chips, and it takes five of the green to appear more than the white. [These ratios are proportionate to the space occupied.] This particular experiment is more useful in showing the mechanism of the child's judgment of numbers than in demonstrating his ability in that direction.

His ability comes out more clearly in the following experiment. One shows him a group of objects, which are then hidden behind the experimenter's back, and produced one at a time, until the child says that there are no more. In the event that the child says there are no more before they have all been brought out, the remaining number of objects offers an index of the size of his error. These children were able to count correctly when as many as seven objects were used. This experiment is particularly of note as it was used with the feeble-minded in 1908 in the same way, and with similar results.

These investigations into perception were continued, but definitely as investigations into intelligence. The next article, called "Perceptions d'enfants" (*R.P.*, 1890, 30, 582-611), opens with a definition of intelligence in terms of perception:

"What is called intelligence in the narrow sense of the word consists of two principal things: first perceiving the external world, and then taking up these perceptions again in the memorial state, handling them again, and meditating on them."

"In the two studies which follow we shall try to determine what perception and ideation present that is peculiar to children of two to five years." (Binet, *loc. cit.*, p. 582.)

Clearly, he is studying the peculiarities of intelligence accruing to peculiar ages, and, as his experiments show, he is doing so through complex rather than through simple functions. Even in the simpler experiments, as that on the naming of colors, he does not keep away from more complex problems, as the process by which the name and color become associated.

Most of the tasks which he set the children, however, were more complex than color-naming. He considered it essential for a knowledge of perception to know how well reproductions are recognized and interpreted, and thus originated the test of having the child tell what he sees in a picture. Children as young as 1-9 recognized familiar objects in pictures, but not even at 4-4 did they recognize a nose or ear all alone. This peculiarity Binet attributed to the child's inability to analyze:

"What is lacking to the child, what prevents him from grasping the meaning of the foregoing pictures, is that he does not possess the gift of analysis to the same extent that we do. We adults easily succeed in representing the different parts of the body to ourselves as complete wholes; our representation may not be a copy of a former perception; we can break up one of our perceptions and represent to ourselves only a piece of it. It seems that the child does not as easily execute the task of disassembling. He has perceived the object taken as a whole, and to recognize it he usually needs to perceive anew the total impression; whereas it is lacking in the preceding drawings. That is why he does not understand them." (Binet, *loc. cit.*, p. 592.)

Especially worthy of note in this passage is the complete absence of any explanation by association; indeed, the idea that the child takes the object first as a whole and then learns to break it up is actually out of keeping with associationistic doctrines. (This article, it must be remembered, appeared two years before *Les altérations de la personnalité*, with its formal repudiation of associationism.) The emphasis on the whole, as being thus genetically prior to the parts, and more important, crept very gradually into Binet's psychology (see *The Intelligence of the Feeble-Minded*, translated by Elizabeth Kite, pp. 198-209) without ever being recognized, however, as a general principle.

The experiment with pictures was extended to see whether the children could recognize the emotions portrayed, and it was found

that Madeleine could recognize laughter and tears—nothing else.

Under the title of "La notion d'une chose," in this same article, Binet reports another investigation into perception which later turned into the vocabulary test of the scale. The child was asked, "What is a fork?" "What is a horse?" etc., and her responses were noted. Here it was discovered that children as young as this cannot define words except by stating the use to which the object is put, as, "A fork is for eating." They showed also a trait found later (1909) in dementes, that of using different forms of the same idea for defining successive ideas; as, "A dog bites," "A lamp does not bite."

Careful questioning demonstrated that children can tell the difference between reality and dreams; no practical use was, however, made of this discovery. Observation of their failure to use correctly the pronoun "I" (the child used the objective of the French form, *moi*, instead of the nominative, *je*) until long after the correct use of all other pronouns had been established, indicates that they do not have a distinct notion of the "self" before the age of 3-2 at any rate.

As has been indicated, these studies were not, like earlier ones or even others conducted at the same time (on hysterical patients) destined to form part of a treatise, or to support or test a theory. In a sense, they were purely unsystematic, the handiwork of an opportunist who was presented with material and did what seemed best with it. They are none the less important for all that. They are the first experiments Binet performed with normal subjects; and doubtless the importance and number of the problems which these subjects presented to him—of mental organization, mental development, mental measurements—provided an impetus toward continued work with normal subjects.

The researches of this period, moreover, show a lack of coherence one with another that can best be accounted for by supposing that Binet was growing more and more unsettled in his ideas about psychology. His first few articles, as we have seen, were all part of his campaign to establish his theory of reasoning. Those that followed grew out of problems that arose in connection with theory—problems of the location of the seat of images and hal-

lucinations, which in turn gave rise to the problems of suggestion, and these in the end led to the problems of the organization of personality and the basic laws governing it. The articles on fetishism in love and on the psychic life of microorganisms alone fail to fall directly in line with this steady march of thought from absolute acceptance of associationism to almost equally absolute repudiation.

But the articles from 1890 to 1894 fail to show any such definite connecting thread. Some of them, up to 1892, complete the researches into the nature of consciousness, but others are on the perceptions and movements of children, on rotary movements in insects, on the memory of lightning calculators and of chess players, on synesthesia, on speed in graphic movements. The reports on children, of course, are of historical importance, and the investigations into lightning calculators and chess players are still significant today; but what seems to hold all these together, and make them significant in the whole of Binet's work is that they represent a groping after a method of experimenting with normal subjects, and still more, a groping after the problems with which such experiments ought to deal. Thus it is altogether logical that the work of this period should have culminated in another handbook, which this time is a masterpiece of clarity, order, and concision, *La psychologie expérimentale*.

Such being the nature of these articles, it stands to reason that they do not all deserve as full treatment here as has been accorded to most of the preceding. The one on "Les mouvements de manège chez les insectes" (*R.P.*, 1892, 33, 113–135) describes the rotary movements of insects after an operation on the brain ganglion, and offers a hypothesis to explain it. The hypothesis assumes that one part of the brain has been injured more than the other, and that muscular excitation is, therefore, unequal, and causes the insect to adapt itself to circular movement.

A report on two cases of synesthesia (color hearing) was published with Beaunis; it attempts to analyse synesthesia by the reaction time method. It is found that the reaction time between the number (stimulus) and the color (response) is about equal to the time intervening when the stimulus and response are both

numbers. In the latter case one is finding the reaction time for an artificial association which has become automatic through long use, and since this is about equal to the reaction time for number and color, it is suggested, though very cautiously, and not too logically, that perhaps this is also an association which has become automatic through long use. ("Recherches sur deux cas d'audition colorée," *R.P.*, 1892, 33, 448-461.)

The perception of time was investigated (really in connection with the questions of alterations of personality) in order to determine whether the limen is a point below which there exists no consciousness. Some subjects always were in error when the stimulus was below the limen; for them consciousness begins at a definite point. With other subjects the number of errors increased gradually as the stimulus went lower below the limen; and for them consciousness does not begin at a definite point. One might expect that the author would conclude that there are individual differences in this respect, but he does not.

What was the directive idea behind these and other studies which we have not reviewed here is hard to say. From the way in which experiments of this type were later cited in the handbook on experimental psychology we may suppose that they were a more or less conscious sounding of the possibilities of different methods of investigation, to see what problems they were suited to, and what kind of results might be obtained.

With respect to the investigations into memory we are more fortunate, since they were brought together into book form, and in the preface Binet states definitely that the directive idea was that they might be of some use to pedagogy. The researches, as a matter of fact, were suggested by Charcot, who had a good deal more to do with them than is realized by those who read only the book (where Binet's name stands on the title page alone) and do not go back to the original articles. One of these was written by Charcot with Binet as co-author, and in others there are frequent references to Charcot, as well as to Janet. In the light of the importance which pedagogical implications soon began to assume in Binet's work, there is no reason to doubt his sincerity when he gives that as his purpose throughout. Nor

is it improbable that his interest in pedagogy evolved from his observations on his own children.

Charcot had before this proposed that there may be memorial types: visual, auditory, motor. The investigations on Inaudi and Diamandi were performed definitely to find out whether they belonged to particular memorial types. In turn, of course, the investigations threw some light on the nature of these types.

These researches are so well known that it is hardly necessary to summarize them fully here. The calculators were studied very carefully, note being taken of their early education, their memory span, their methods of calculating, and so forth.

Inaudi, who had been a shepherd with nothing to amuse him but mental arithmetic, and no other education (he was unable to read until a short time before the investigation was undertaken), naturally employed the auditory memory; so far as numbers were concerned, there was no other memory which he could have employed. When the experimenter recited numbers to him in groups of three, and had him repeat them once after him, Inaudi was able to remember about fifty numbers at a time. After an evening's performance he could remember from 200 to 400 numbers which had been given to him.

It was suspected that Inaudi was making use of subvocal speech in remembering and calculating; at Charcot's suggestion a control experiment was run, in which Inaudi was asked to pronounce a vowel sound all the while he was calculating. Any subvocal speech would therefore be eliminated or would be noticed by its effect on the vowel sound. His speed in calculating actually was reduced, and disturbances in the vowel sound testified that he was using speech. No account was taken of the distracting effect of producing the vowel sound.

In calculating, Inaudi broke a problem up into parts, instead of doing it as a whole as one would when doing it on paper. As for his speed, it was no greater than that of a good bookkeeper. His very short reaction time showed that he had a great power of attention.

In one of the reports on Inaudi published in the *Revue philosophique* (Binet, "Notes complémentaires sur M. Jaques

Inaudi," *R.P.*, 1893, 36, 106-112) Binet goes so far as to suggest that Inaudi's very ignorance may have been a prerequisite to his development as a calculator. Had he gone to school as other children had, he might have grown up to be just as ordinary as they, but in this way his energies were all diverted into this special channel. Binet is far from supporting any theory of special abilities. (*Binet, loc. cit.*, p. 109.)

M. Pericles Diamandi, the Greek calculator, provided an interesting contrast to Inaudi by being of the visual type. He was studied in the same way; that is, his memory span was tested, and he was given a number of problems to perform. For him, of course, it was necessary not to hear but to see the numbers which he was to remember. His memory was neither as quick nor as powerful as Inaudi's, and was subject to a peculiar limitation. If he was asked to remember a series of twenty-five figures, each of which was differently colored, it took him two separate and distinct efforts to perform this task. Moreover, even though his memory was visual, he recited the numbers from left to right, and was greatly handicapped if asked (as was done at the suggestion of Janet) to start at the right and proceed to the left.

The experiment which served to compare the two, Inaudi and Diamandi, was suggested by Charcot; this was the one in which a square of twenty-five numbers was to be repeated by diagonals, also by spirals. Although for straight repetitions Inaudi was incomparably faster than Diamandi (for twenty-five numbers his time was forty-five seconds, as compared with Diamandi's three minutes) for these complex operations Diamandi had distinctly the advantage. For instance, it took Diamandi thirty-six seconds, and Inaudi ninety-six seconds to repeat a square of twenty-five numbers by ascending columns. Inaudi's superiority is not unquestionable.

Both Inaudi and Diamandi memorized without any aid but that which comes from grouping and from rhythm. The mnemotechnician, M. Arnould, by various devices succeeded in remembering much more than could either of these calculators. What the latter had been given to memorize was numbers—just numbers, without any significance of any kind, except that they were

to perform certain operations with them. The trick of the mnemotechnician is to give meaning to the number. M. Arnould accomplished this by letting a consonant stand for each of the ten numbers. When he was given a series of numbers to remember, he took the corresponding consonants, added vowels to them, and constructed words and phrases. These were, of course, easier to remember than the numbers themselves; and it was simple afterwards to translate them back into numbers. By this method, although inferior to Diamandi in memorizing a short list of numbers, he was much faster in a long one, even though the time it takes to repeat the numbers, as there is an intermediate process of translation involved, was slower.

In the case of chess-players who play blindfolded, one is dealing with a form of memory not strictly comparable with memory for numbers. Chess-players, however, can furnish valuable information for the investigation of partial memories. It was assumed, before this, that the man who plays chess without seeing the board before him must have a very clear and distinct visual image of the board and all its pieces. This hypothesis was put to the test by circulating a questionnaire among such chess-players and analyzing their answers. And it was found that in this playing of chess blindfolded, the meaningfulness of the subject-matter reaches its highest importance; it had been almost *nil* with the calculators, and secondary with M. Arnould. With the chess-players it is the meaning of the pieces and of the moves which enables them to remember what has happened. A player, to be able to play blindfolded, must be a good theoretician; he is able, thereby, to see the significance of each of the moves. If he is playing several games at once, he will have forgotten all about the first game by the time he has come to the last board. When he returns to the first board, the referee announces what his first opponent's last move has been, and this move reminds him of all that has gone before. In recalling games that have been played in the past, chess-players tend to recall the moves that have significance in the whole game, and to forget moves that really played no part in it.

Reports of the visual imagery of the chess-players revealed

that some employed very concrete images of the board and chessmen with which they were familiar; but others, like Sittenfeld, visualized an abstract board in black and white, with no individual characteristics. The pieces and board (the whole sixty-four squares and thirty-two pieces) are not seen with absolute distinctness. The player may see only the important squares on the board, and the pieces may be represented rather as lines of force than as bishops, knights, etc.

Thus the visualizations of the chess-players border very closely on the problem of the use of imagery in thought. (The use of such images had been taken for granted in *La psychologie du raisonnement*.) One player, Mr. Forsyth, came very much closer even than Sittenfeld to describing an imageless thought. He could not report any visual imagery at all:

"*I do not see the chessboard at all*, but, in spite of that, *I think* of a chessboard of the size of those on which I am in the habit of playing. I think of the squares as being light or dark; and as to the pieces, although I imagine that they are of different colors, I pay more attention to the fact that they are forces belonging to me, or hostile forces. . . . I pay very little attention to the forms and to the colors of the pieces. The power of the piece, rather than its color, is the important idea. Although I think confusedly of the form, I recognize the pieces primarily by their power, and their form is to a degree associated with their power." (Binet, *La psychologie des grands calculateurs et joueurs d'échecs*, p. 306.)

This observation was treated by Binet only in a footnote:

"Let us notice this distinction: 'I do not see, but I think . . .'; it probably indicates a lack of clearness in the mental image; perhaps there is something else. These phenomena are still quite obscure." (*Ibid.*, p. 306.)

Binet did not yet dare to suggest imageless thought, the discovery of which later gave a new direction to his system of psychology.

Despite the prefatory remark that this book is meant for pedagogy, there is not a single attempt to draw any conclusion for teachers; but there is a host of implications, not only for the pedagogue, but still more for the psychologist. There are two well-nigh antagonistic principles in the book: first, that a particular, partial memory may be developed to an abnormal degree by proper education; secondly, that the meaningfulness of the material to be memorized may enhance the person's memory and bring it to the level of an over-developed memory like Inaudi's. But although a partial memory may be over-developed, it should

not be concluded that children are to be looked upon as falling into particular memory types. Particularly in the reports on Inaudi the point is stressed that the development of his great memory for figures was probably in part accidental; moreover, though he used auditory images, Binet does not suppose that visual imagery failed to play some part.

"Nevertheless, one must beware of all exaggeration. One must not suppose that there exists, even for a partial memory, an absolutely pure auditory type; real life does not make such schemas. M. Inaudi, in sum, has not lost the use of any of his memories; in his brain the sensory centers for sight and hearing are contiguous in the tissue; it would then be quite unbelievable that the centers for mental vision should never be put into use during his operations of mental arithmetic. In reality, when one says that a person belongs to the auditory type (with respect to a particular operation, of course—this is a reservation that is often forgotten), one simply means that in this person the auditory memory is *preponderant*." (Binet, *op. cit.*, p. 71.)

The effect of meaning on retention was further studied at the same time as this book was appearing; two studies on memory for words and memory for sentences were published in the first volume of *L'Année psychologique* (1894).

A book which is much more important than this for the understanding of Binet's work appeared in the same year, 1894. *L'Introduction à la psychologie expérimentale*, though written in collaboration with Phillippe, Courtier, and Henri, is evidently the work of a man who has spent some time putting his mental house in order. It defines psychology, reviews its present status (as indicated by the number of laboratories), exposes and discusses its methods. Its aim is exposition, not evaluation, but some evaluation creeps into the book, and one senses that considerably more of it took place in the mind of the author.

Psychology is characterized by introspection. But introspection is taken in the broadest sense of the term.

"When one person is observed by others on a particular point it is possible to infer from external signs that he experiences certain emotions and certain passions. One can thus read into the mental states of the person and repeat them as if experiencing them oneself. The study of these phenomena is introspection." (Binet, *loc. cit.*, p. 18.)

By this definition, of course, he immediately places himself outside the whole school of the content psychologists.

The methods of psychology are two. One, experiment, fills

the journals, but throws light on only details and minor matters. The other, observation, provides the bulk of such monumental works as William James' *Principles*. The methods of experimentation and observation are taken up one by one.

"In entering into the detail of the experimental method, one will perceive that in general the studies are more precise and satisfactory as they have to do with more limited points, and that on the contrary the investigations which have to do with great *ensembles* and give a synthetic idea of the mind have the defect of producing vague and unverifiable results." (Binet, *loc. cit.*, p. 21.)

The study of sensation produces the most satisfactory experimental results. Although the experiments on sensation seek to know the relations between the anterior excitation and the sensation provoked by it, Binet suggests that a more enlightening study could be made by studying instead, the intellectual states which are provoked by the sensations and which react on them.

"We think that this kind of research, more difficult, more complex than the preceding, should be more widely exploited. One would probably find in it a method for the study of the mental functions higher than the sensation. These functions, such as judgment, imagination, reasoning, are hardly susceptible to direct experimentation, when one takes them in the form of intellectual acts affecting ideas; in this case one can neither analyze them with ease, nor submit them to any even approximate measurement; on the contrary, if these same acts are found involved in sensations, one may succeed, under favorable circumstances, in modifying the sensation which provokes them and in that very way in acting on them." (Binet, *loc. cit.*, p. 44.)

In any event, the study of sensations should not be divorced from observation, as had been done when apparatus had been perfected. The attempt has been to make the subject's responses as simple as possible, and consequently almost void of details concerning the psychological state to be studied. This was carried to an extreme in America, where experimenter and subject might be in different rooms, and communicate only by electric bell signals.

"In sum, the foreign experimenters seem often to predict the results of their experiments before setting them up; they foresee that each subject will be able to reply in two or three different ways; and the researches which they make afterward seem to have no other aim than to determine the number of times that each of these replies will be given. One seeks, therefore, only to determine a numerical quantity which can afterwards be explained in calculations and tables. One seeks simplicity, but it is only a factitious simplicity; it is

artificial, produced by the suppression of all annoying complications." (Binet, *loc. cit.*, pp. 29-30).

Even if one could not judge from Binet's work during the preceding decade that he was primarily concerned with the more complex and also the more fundamental of the mental processes, and that he had come to emphasize the importance of observing what is there, these two passages in themselves would serve adequately to describe his attitude in the matter of experimentation. None of his experiments to date had been of a statistical kind—they were so, indeed, beginning *after* the publication of this book. Whenever he did use the graphic method and the like, he always employed with it introspection as he himself defined it. His attack on statistical procedure in psychology resembles that made by Köhler some thirty-odd years later, when he (Köhler) pointed out that psychology is still too young to become a quantitative science; there remain too many qualitative facts to be discovered before psychologists can begin to apply quantitative procedures. Is not that the very gist of the above passage quoted from Binet? And though he is in a sense the father of psychometrics, it will be shown in the pages following that, even though he did lead the way in measurement, yet for him the measurement itself was not of paramount importance; it was subordinated to the discovery of qualitative phenomena.

The methods of experimenting on movement, on memory, and on ideation, and psychometrics are all systematically described. The same preference is manifested throughout for getting at the more complex functions. Memory is not limited to the reproduction of a sensation, but includes the reproduction of a "complex group of states of consciousness having as object the recognition of an external object." In the chapter on memory, also, appears a concrete suggestion for the study of individual differences:

"... one may, to begin with, propose to make comparisons between the memories of different persons, to the end of measuring individual memories, or one may propose to investigate the development of a professional memory under the influence of exercise." (Binet, *Introduction à la psychologie expérimentale*, p. 87.)

This suggestion he himself carried out, as he did also some of the proposed experiments in the chapter on ideation. Under ideation one studies the nature of ideas (images and general ideas) and their mode of suggestion; that is, the conditions in which ideas are called up. The nature of ideas can be known only by questioning the subject. In this connection he suggests the experiment which forms the basis of *L'Étude expérimentale de l'intelligence* (published in 1903). One asks the subject simply to write ten words, or to describe ten acts performable on the site, or to make ten drawings. The words given relate less to objects present than to habitual ideas, and so provide an opening for the study of the nature of the person's ideas.

Experiments on the association of ideas fall into the same class, that is, they are experiments on ideation. They are most fallible, as the operation of chance attains its maximum in them. Nevertheless, they too may be plied into use for the study of complex functions:

"There would be other experiments to be performed where the two words to be associated would be given to the subject, who would have only to give the proper association—of cause to effect, means to end, contiguity, etc., capable of uniting the two words. In developing these researches in this direction, one would certainly arrive at experimenting on judgment and other complex functions." (Binet, *loc. cit.*, p. 102.)

And as a matter of fact, the method here suggested is analogous to that later used by the Würzburg school in the study of thought.

Psychometrics, which meant something different in 1894 from what it does in 1934 (it included reaction-times, graphs, etc.) he tries to justify. They were said to be useful for studying such phenomena as the speed of thought, the formation of habit. The reaction time has proved useful in studying different states of mind; for instance, the time for choice varies with persons in normal state or suffering from melancholia, delirium, etc.

The second part of the discussion, that of methods of observation, shows the effect of the recent emphasis on individual differences.

There are said to be three kinds of observation: personal observation, comparative observation, and the observation of unknown persons through questionnaires.

Personal observation, that is, the author's own introspection, is useful but dangerous: (1) he may be led to observe in himself whatever is necessary for the upholding of his theory; (2) he may belong to a peculiar type, and his observation will lead to generalizations which will not be true for the average person.

Comparative observation seeks to nullify the defects of personal introspection. One has other persons observe themselves, and one subjects their observations to control, if possible, by having some persons observe others. The discussion of this method is not very extensive, but one concludes that through comparative introspection it is possible to cancel out the effects of individual differences and so find out what is true for general psychology, or else to classify the findings and thus discover the psychological types and their peculiarities. The latter was the method followed in Binet's later work. He states as its advantage that in observation of this kind one has to do with spontaneous and natural phenomena, and not with provoked phenomena (referring, of course, to experiments in which the terms of the response are dictated to the subject) which are artificial and constrained. One studies herein the living reality. On the other hand, it is less precise than experimentation, because one cannot measure anything.

The questionnaire is rated as the least valuable method of observation. The worth of the replies must be checked up by the self-consistency of the subject and consistency among the different subjects.

These quotations, put together, show clearly what was Binet's theory of experimentation in psychology. Briefly, experimentation should always try to attack the more complex functions, as it is from these that one learns most about mental mechanisms. One should experiment, and the experiment should be so set up that one utilizes the most reliable means of studying the complex functions. Experimentation should always be accompanied by observation, from which comes the great bulk of our psychological information. The method of comparative introspection should be used, because psychology cannot overlook the importance of individual differences. The study of individual differ-

ences leads to a knowledge of psychological types, and also to an improved knowledge of the individual—since, for instance, the comparison of the memories of different persons enables one to measure the individual memory.

All this should be noted. It is the result of careful, systematic thought. And it is an index to the direction which the same man's thought would take in the future.

In closing this chapter, it is useful to recall another reference to intelligence, since that topic was soon to become of paramount importance. Concerning sensation, Binet says:

"We cannot sufficiently insist on this idea that the sensation as a simple element is never realized alone in an adult person; it is for the purposes of study and analysis that one separates the sensation from all that which accompanies it; in reality, behind the sensation there is always the intelligence, as behind movement there is always the will." (Binet, *Introduction à la psychologie expérimentale*, p. 25.)

This statement is ambiguous, since the comparison of intelligence with will seems to make active agents of both; yet elsewhere Binet speaks as though 'intelligence' were synonymous with 'consciousness.' At any rate, it is indisputable that 'intelligence' as referred to here is something more fundamental and general than sensation. We have already seen that 'intelligence' is elsewhere coextensive with conscious mental processes—memory, reasoning, judgment, etc. None of the passages cited allows us to say whether intelligence is something distinct from these processes, though in the majority of them this seems doubtful (intelligence is usually *identified with* these processes). Whether intelligence *is* memory, reasoning, and judgment, and a host of other functions, or something distinct from these but acting on them, it is clearly somehow related to the governing forces of the personality.

It is not unreasonable that, since individual differences oppose an obstacle to the drawing of valid generalizations in psychology, psychology should first study individual differences before attempting to generalize. And the first place to look for individual differences is in intelligence; not only because empirical observation shows pronounced differences in this respect, but also

because intelligence as conceived by Binet includes so much of the personality that differences of personality must be related to differences in intelligence.

This is approximately the train of thought that led Binet to draw up a program of investigation for psychology which concerned itself with individual differences in intelligence.

## CHAPTER III

### INDIVIDUAL PSYCHOLOGY

In 1895 Binet came boldly out and informed the psychological world what he was doing, where he intended to go. In doing this he definitely left behind him the period of drifting, of following up interesting ideas as they came along. He had thought through the question of what constitutes the main problem of psychology; and then drawn up a program for dealing with this problem. For the subsequent decade he devoted himself to following out this program.

The problem of psychology was, of course, to study individual differences, qualitative and quantitative. With Victor Henri, Binet stated the aim of individual psychology, and the methods it should pursue. (Binet and Henri, "La psychologie individuelle," *L'Année psychologique*, 1895, 2, 411-465.)<sup>1</sup>

The aim of individual psychology is said to be

"to study the different psychic processes of man . . . it studies the properties of the psychic processes which vary from one individual to another; it must determine these variable properties and then study to what point and how they vary according to the individual." (Binet and Henri, *loc. cit.*, p. 411.)

The aim of studying the variation of processes according to the individual divides itself into two main problems:

"1. To study how the psychic processes vary according to the individual, what the variable properties of these processes are, and to what point they vary.

"2. To study the relations to each other in which the different mental processes are found in a single individual." (Binet and Henri, *loc. cit.*, p. 411.)

The purpose of individual psychology is to enable the psychologist to state in what respects one individual differs from another. Hence, the processes to be employed in this study are those which serve best to tell the differences between individuals. Though, up to this time, a good deal of use had been made of sensations, which lend themselves most readily to accurate experimentation, they are not of great value for such differentiation.

<sup>1</sup> Hereafter *L'Année psychologique* will be referred to simply as *A.P.*

"We shall cite some of the results which emerge from all these studies. The first, the most important of all, we believe, is that the more complex and the higher a process, the more it varies according to the individual: sensations vary from individual to individual, but less than memory; the memory of sensations varies less than the memory of ideas, etc. There results, thus, that if one wishes to study the difference existing between two individuals one must begin by the most intellectual and the most complex processes, and it is only secondarily that one must consider the simple and elementary processes." (Binet and Henri, *loc. cit.*, p. 417.)

Here, as in 1890, it is memory, reasoning, judgment, etc., that serve best to differentiate between individuals, though they are not here called intelligence.

The variation of processes among individuals must be studied through the interdependence of different processes and through a knowledge of norms. That is, before anything else can be said, it must be known whether development or weakening of "faculty" *A* will entail development or weakening of "faculty" *B*:

"Thus, when we observe that the loss of a faculty, *A*, involves a weakening of a faculty, *B*, and that the extreme development of *A* involves a development of *B*, can one affirm that when of two normal individuals one has the faculty *A* better developed than the other, he will also have the faculty *B* better developed? . . . It would be necessary, to give an answer to this question, to study by how much *at least* faculty *A* must differ from the normal average for a difference to result for faculty *B* also . . ." (Binet and Henri, *loc. cit.*, p. 420.)

The basic concept of individual psychology, then (though it is hidden amid a wood of other considerations), is the norm with the deviations from it. The relations between processes are perhaps of more immediate importance, because when these relations are known, one can predict the status of one process from a knowledge of the other; but this knowledge itself depends upon the knowledge of the norm.

The study of the relations between processes in an individual may be pursued in two ways:

"1. In a single individual one causes a variation of one mental process and one studies whether this variation induces with it changes in other processes of the same individual.

"2. One chooses in advance a certain number of mental processes and one studies them in a number of individuals. One then examines whether the individual differences for the different processes go parallel to each other and correspond to each other in a regular manner; from this correspondence one can deduce the more or less intimate relations among the different processes." (Binet and Henri, "La psychologie individuelle." *A.P.*, 1895, 2, p. 421.)

On examination, one sees that this second method is not very

different from the first, except that it is subjected to the control of numbers, and the first is not (although it ought to be). In order to utilize the first method, one must be able to alter faculty  $A$  to  $A'$ ,  $A''$ ,  $A'''$ , without changing the normal state of the individual; and it is necessary that when faculty  $A$  has been so altered, the effect of this change shall be the same on faculty  $B$  as if in *different* persons there were naturally a faculty  $A$ ,  $A'$ ,  $A''$ , etc. That is, the effect of possessing an induced faculty  $A'$  must be the same for faculty  $B$  as would the possessing faculty  $A'$  by nature. The idea is not, then, to discover the effect of changing faculty  $A$ , but is really to discover for the general population what state of faculty  $B$  corresponds to faculty  $A$ ,  $A'$ ,  $A''$ , etc.

The faculties or processes employed in the second method, as well as in the first, must be those which will be most likely to bring out differences among individuals, and these are the most intellectual processes. Unfortunately, these are the ones least accessible to experimentation and quantitative determination; but they are none the less more useful than tactual sensitivity, color blindness, and other processes easily amenable to laboratory methods.

What is aimed at, however, is not simply a knowledge of differences in degree. The results obtained by Gilbert, who showed that children perceive less well, react less well than adults, are criticized for not really giving all the differences between the child and the adult. For, says Binet, the child not only has a smaller memory, smaller motor ability, smaller attention, but it has also a way of its own of thinking, of reasoning, of willing, of remembering. The mental tests should acquaint us with these qualitative differences as well as with the quantitative ones. This point is important because, in the first place, it can be shown that the desire to discover qualitative differences dominated more of Binet's researches than did that for quantitative differences; secondly, those who have taken up his scales with the greatest enthusiasm have not taken with them this conviction that they should be used in the discovery of qualitative facts.

The function of the tests should not be merely to ascertain that this individual is more perceptive, for instance, than another, but

they should throw light on the peculiar make-up of the individual himself. The following passage sketches how the tests were to be employed to elucidate the mental make-up of the individual and to bring out the effects of both heredity and environment on individuals; and it indicates the directions in which the study of individual differences should proceed in order to discover qualitative differences:

"We cannot wait for scientific study to be pushed far enough to indicate to us which are the most important processes which it suffices to study to characterize the person; one must investigate whether, with the knowledge and the means which we already possess we cannot already determine series of tests to be made on an individual to distinguish him from others, and to be able to deduce from them some general conclusions relative to certain habits and functions of this individual. The matter seems to us possible in some measure. One must first of all distinguish the cases where one has to examine persons belonging to the same environment, carrying on the same profession, and where one intends to compare them among themselves to determine their most important individual differences and their most characteristic ones. These cases must be treated apart from those in which one will want to compare among themselves individuals carrying on different professions. Thus, for example, one will have to employ other tests in the comparison of two students with respect to the same faculty than in the comparison of a prestidigitator with one of the students. . . . Then, the tests must be adapted to the environment and daily occupations of the individuals; it will not be possible to use the same tests to compare among themselves two masons as one uses to compare two students or two school children.

"The studies of individual psychology, which are one of the most important practical applications of psychology, since their aim is to know individuals, must be envisaged and directed according to the goal which one intends to reach. There are, it seems, four principal directions in which one may occupy himself; the study of races, the study of children, the study of sick persons, and the study of criminals." (Binet and Henri, *loc. cit.*, p. 433.)

The purely practical considerations affecting the nature of the tests are that the methods of the experiments must be simple, and not take up too much time; then, the methods of determination must, as much as possible, be independent of the person of the experimenter, and the results obtained by different experimenters must be comparable.

As it has so often been pointed out that the most significant differences among individuals are arrived at through the study of the higher processes, the following are suggested as the most likely to be of benefit to the psychology of individual differences:

"Memory, nature of mental images, imagination, attention, faculty of comprehension, suggestibility, esthetic feelings, moral feelings, muscular strength

and strength of will, ability and acuity of observation (*habileté et coup d'oeil*)."  
(Binet and Henri, *loc. cit.*, p. 434.)

Muscular strength and strength of will are grouped together, evidently with the intention that strength of will should be studied through muscular strength.

The latter half of this article is devoted to indicating the tests, under each of these ten heads, which would be useful in the study of individual differences. The tests suggested, it should be noted, are not necessarily original.

The experiments on memory include tests of practical memories: (1) The visual memory of geometric design. (This was one of the experiments used with the lightning calculators.) (2) Memory of a sentence (approximately sixty words). (Binet had already reported such a test in 1894; his experiments will be reviewed below.) This reproduction, he says, gives an idea of the subject's comprehension, for

"memory is . . . not a simple fixation of the sensations, it is an intellectual process, which consists in coördinating the sensation and in imbuing it with meaning. One remembers especially well that which one has understood."  
(Binet and Henri, *loc. cit.*, p. 437.)

The reproduction also gives an idea of the subject's emotional type. (3) Musical memory. (4) Memory of colors.

The test suggested for the nature of mental images is again one that was used with Inaudi and Diamandi—the memorial reproduction of three rows of four letters each.

Among the tests of use for the imagination are the ink-blot test; Ribot's experiments on abstract words; the composition or completion of a picture by the subject; the construction of as many phrases as possible containing three specified nouns; the development of a theme.

Attention is not a process, but a quality, a way of being of the processes. It is possible, however, to study its duration and its constancy by obtaining the regularity and the variations of the processes while they are in operation. (E.g., the mean variation of reaction times; the speed and number of errors in crossing out the *as* on a printed page.) The field of attention can be estimated from the number of impressions or acts which can be included in a single act of attention. (Binet uses the word *act*,

though it is obviously inconsistent with his definition of attention.) The methods of measuring attention still left room for improvement.

Comprehension is also difficult to test; for the vague term comprehension is used "To designate a vast assemblage of complex faculties which psychology is wrong in not giving much time to. Comprehension is that by which we distinguish between the reality and the appearance, the essential and the accessory; by which we grasp the relations of cause and effect; we analyze, we synthesize. It is the *esprit de finesse*, intuitive rather than reasoned, thanks to which we grasp puns, or imperceptible nuances of language." It is common sense, judgment, which indicates the probable course of events, the changes of a situation, the better side to take. One devises tests for these different aspects of comprehension: thus, observation may be tested by asking for an explanation of the movement of the parts of a machine which the subject observes in motion; penetration may be tested by definitions, differences between synonyms, criticisms of inexact or incorrect sentences.

Suggestibility has come by now to mean something less definite but probably more correct than the definition in *Le magnétisme animal*: it is the influence which personalities in contact exert over one another. Suggestion may operate, of course, on different processes, and tests are suggested for four of these. First comes the test which Binet and Henri had themselves employed, for the effect of suggestion on perception, that is the experiment with lines of different lengths which were shown to the child; the child was asked to find the counterpart of the line from a chart, and the effect of suggestion was such that he continued to choose a line from the chart even when the line shown him was longer or shorter than any on the chart. Similar experiments can be performed with odors. A second kind of test deals with imagination through anticipation. One puts the subject's finger in a tube to which is attached a wheel that makes a noise when turned. The subject expects an unknown sensation. One finds what kind of sensation the subject experiences and how many turns of the wheel it takes for the subject to experience anything.

Third is emotional disposition: one announces an experiment on painful pressure, increases the pressure until the subject signals to stop, and repeats the experiment. The difference between the second trial and the first (where the signal will be given earlier) measures apprehension due to suggestion. Fourth and last come experiments on involuntary and unconscious movements similar to those obtained in the eighteen-eighties by suggestion, with hysterical patients.

Esthetic feelings are to be investigated by experiments using the "golden sector," squares, and so on, and by comparisons of colors. The relation between the subject's preferences and those of artists should be studied. If these preferences are unstable, changing, they do not correspond to a developed esthetic feeling. These questions can be studied by tests with rectangles, with colored squares to be associated, and with musical phrases to be understood.

The study of moral feelings also borders on little known territory, that of emotions.

"Theoretically, one must admit that the different emotions which move us, having always a bodily counterpart, could be studied with instruments of precision to determine the physical signs of the emotions of an individual so as to discover what he is living through." (Binet and Henri, "Psychologie individuelle," p. 459.)

But the study of emotions with instruments of precision had certainly not in 1895 advanced to a stage where it would be useful in diagnosing a person's moral feelings. In the meantime a less scientific substitute is suggested: to present visually to the subject a series of pictures, all kinds of photographs, representing very meaningful scenes, views, religious and martial subjects, and to note the subject's physiognomical expressions and his reflections as he looks at each picture.

The tests for muscular strength and strength of will are such as give at the same time information on both of these. For instance, the dynamometer shows muscular strength; the difference in pressure exerted in the presence of a young woman indicates the man's vanity or his sexual, emotional disposition. In this way it is an indication of his volitional strength.

Motor skill and visual judgment are not extensively discussed.

Bryan's test, putting a needle through a small hole, will do for motor skill. For visual judgment one asks the observer how many times one line is contained in another.

Such, in sum, are the tests by which individuals are to be differentiated one from another. One can see that even when the tests are on the simpler processes, such as visual perception, the aim is to delve into the subject's state of mind, in accordance with the way Binet had argued in his handbook on experimental psychology, so that by changing the sensation one might change the higher processes accompanying them, and thus study these higher processes rather than the sensation alone. (See above, page 38.) In this way the judgment of the lengths of two lines served in the study of the subject's suggestibility; the list of ten words given by the subject in the experiment served as what we should now call a personality test. Binet used this method extensively.

The study of individual differences is the theme running throughout Binet's researches during the ensuing decade. The program which he and Henri had drawn up was essentially the one which he himself followed, even to the extent of trying to apply methods of measurement to the emotions. Even in 1894, indeed, he had begun to experiment on individual differences. In the first volume of *L'Année psychologique* he reported researches on the memory of words and sentences which showed differences due to age and to intelligence. Immediately after the appearance of the program, also, appeared a number of reports on related subjects. It will be more useful here, however, to skip ahead to the article on "La mesure en psychologie individuelle" (*R.P.*, 1898, 46, 113-123). Here the aim of individual psychology is clarified; and the difficulties of measurement, which had been altogether neglected in the first article, are treated in detail.

The program for individual psychology did not explicitly propose to deal with the measurement of intelligence. It concerned itself with the higher mental processes, which best show the differences among individuals. But these higher mental processes were for Binet intelligence itself, and individual differences, therefore, were differences in intelligence. The article on measure-

ment, therefore, approaches without preamble the measurement of intelligence.

"But if it is a matter of measuring the keenness of the intelligence, where is the method of measurement? How to measure the richness of inspiration, the steadiness of judgment, the penetration of the mind? . . .

"I hasten to declare that I bring no precise solution to these problems; and I do not believe that it is possible at the present moment, when individual psychology is still in the state of project, to invent a satisfactory system of measurement. This system could be constructed only by virtue of *a priori* ideas, and it would not, probably, adjust itself to the immense variety of manifestations of intelligence. It will be necessary to proceed *a posteriori* after having gathered numerous facts. I limit myself, therefore, to setting forth, for the moment, some ideas which have come to me while I contrived experiments." (Binet, *loc. cit.*, pp. 113, 114.)

The 1895 article had, as it were, set the type of experiment to be made—experiments on higher processes, or experiments on simpler processes which nevertheless yield information as to the states of mind accompanying them. Now more exact directions are given for setting up the experimental conditions so that it may be possible to measure without incurring the risks of the ultra-objective experiment. The experiments will have to be modeled according to either of two possible procedures.

The first procedure is to keep the experiment constant, and to measure the varying results obtained. Thus, a person is shown a square, and is asked to draw one from memory; the difference in size between the one shown him and the one which he draws may serve as a basis for the measurement of this special memory. In studies of suggestion also one keeps the experiment constant; the observer may go on matching lines shown to him with lines on a chart, even though the lines there are shorter than the ones shown him. One measures his suggestibility by finding how large the difference between the lines shown and the lines on the chart must be before he notices the discrepancy.

The results obtained by this method cannot always be expressed in precise terms, but one can sometimes establish a gradation of the results. For instance, one reads to students fifteen numbers of six figures each, and has them repeated from memory. No credit is given if a single figure out of the six is incorrect; each subject may then make from 0 to 15 correct answers, and the group may be graded within this range. The morality test also

is graded in this way. One asks a child what he would do in a certain situation, and gives him his choice of a certain number of answers; the answers are given a rank order (which is arbitrary) and are graded as to goodness. Of subjective measurement, however, Binet is wary. He favors measurement only if one has a standard for comparison:

"After numeration comes evaluation. In this case, the method loses some of its precision, and at times it rests in large part on what is arbitrary; one may wonder whether two experimenters would arrive at the same result: not only wonder, but the matter still remains to be investigated." (Binet, *loc. cit.*, p. 117.)

(There seems to be a contradiction between the method of grading suggested, and the criticism of subjective estimation, since the method of gradation is to a certain extent arbitrary. After the standard has been determined, however, there is nothing arbitrary about the way in which the students are arranged in rank order. But when it is a matter of rating the goodness of composition or the like, there is nothing objective about it; it is subjective all the way through.)

The second method which allows one to measure is to vary the experiments, the responses being reduced to the greatest simplicity. Thus, one exposes to the subject an increasing number of objects, and records the number, five, six, etc., which he can remember. Similarly one can vary the interval between the perception and response, and find the optimum length of time for a complete and faithful recall.

Any experiment which is to be precise, which is to lend itself to some kind of evaluation, must be simple either as to its conditions or as to its results. But the simplicity here advised is not what Binet himself would have called a "false simplicity." One does not arbitrarily limit the subject's choice of answers by telling him that he will answer either thus or so, but creates conditions in which he cannot want to give other than a simple answer. Thus Binet escapes the drawback of the previous objective experimentation, but retains its advantages.

The measurements thus made must not be thought of as absolute. There is no unit of measurement in psychology which can be applied to lay off, as it were, equal distances. One cannot tell

whether one difference is or is not equivalent to another. One can only rank individuals.

"I conclude with two remarks.

"The first is that I have not sought, in the above lines, to sketch a method of measuring, in the physical sense of the word, but only a method of classification for individuals. The procedures which I have indicated will, if perfected, classify a person before or after such another person, or such another series of persons; but I do not believe that one may measure one of their intellectual aptitudes in the sense that one measures a length or a capacity. Thus, when a person studied can retain 7 figures after a single audition, one can class him from the point of view of his memory of figures, after the individual who retains 8 figures under the same conditions, and before those who retain 6. It is a classification, not a measurement. It is not at all the same thing as to measure three wood beams; in the latter case one really measures. One establishes, for example, that the difference between the first beam and the second is equal to the difference between the second beam and the third, and that this difference is equal to 1 meter. It is absolutely precise. But we cannot know, with respect to memory, if the difference between the memory of 5 figures and the memory of 7 figures is or is not equal to the difference between the memory of 7 figures and the memory of 8 figures. We do not know, moreover, what the value of this difference is. We do not measure, we classify.

"Final remark.

"It is well understood that these questions of measurement are not the sole objective of individual psychology; this does not limit itself to obtaining the degree of the different processes, but obtains their quality also. There are, in any group of individuals, qualitative differences which are at least as important to know as the quantitative differences. Thus, one meets in a same environment persons, for example school students, who exemplify what one may call the literary type, whereas others belong to the scientific type. To conceive tests which permit one to differentiate these two types, to investigate what are the consequences for the rest of the intelligence, here is a question of capital importance for individual psychology, and one which has nevertheless nothing to do with measurement or with individual coefficients. Another instance: certain individuals are gifted with very strong emotivity—esthetic, moral (sympathetic) or egoistic; it is still another very interesting problem to investigate the physical signs of this emotivity in the undulations of the capillary circulation, in the changes of the rhythm of the heart, or in the respiratory modifications which one can provoke artificially. Here again the question of measurement passes to the second place; it is the qualitative differences which one is concerned with revealing, in order to arrive at forming *natural families* of characters." (Binet, *loc. cit.*, p. 122.)

Thus this article confirms, supplements, and clarifies the first. The aim of individual psychology is to establish differences among individuals; they will be ranked with respect to intelligence, which will be measured through the higher processes, and they will be grouped into psychological types, not only through the study of the higher mental processes, but also, if possible, through that of the emotions.

Binet did not adhere strictly to his program, yet for the next ten years (that is, until 1905), most of his articles may be traced back to some suggestion of the 1895 article.

The 1894 articles on memory so clearly form part of this program that discussion of them has been deferred until now. They report researches that follow logically from those with Inaudi and Diamandi and the chess players. These studies had shown the importance of the significance of the material to be remembered; and so, whereas Ebbinghaus had led the way to the study of memory through non-significant material, Binet used methods similar to those of Ebbinghaus with familiar words and with whole sentences. (Binet and Henri, "La mémoire des mots," *A.P.*, 1894, 1, 1-23; and "La mémoire des phrases," *A.P.*, 1894, 1, 24-59.) In the first experiment he read to his subjects seven lists of seven words each, and obtained immediate and delayed reproductions. Like Ebbinghaus he found that the first and last words in the series are the best remembered and that the conservative (delayed) memory is much weaker than the immediate memory. He supplemented these results, however, by the comments of the subjects, and found again that the meaning of the word is influential in its retention: *pupitre* (desk) was retained by almost all of them because of its familiarity. Furthermore, in immediate repetition the words from the beginning and the middle of the series reappear with their meaning; those at the end reappear only as sounds. The reports of the subjects threw light also on the processes by which they remember. The most important means is the *direction* of attention to the experiment:

" . . . and this last procedure does not appear special, but general and is implied to some degree by all the others, the direction of attention and of will to remember toward the experiment which has just been read. We have an idea of the whole of this experiment, a very vague idea, since the words have sometimes no analogy of meaning among themselves; but all these words have the common characteristic of belonging to the same experiment, of having been learned together, of having been pronounced by one and the same person. They form a whole; and we are capable of fixing our attention on this whole. As soon as attention is fixed, words are revived in our minds, and we recognize by a rapid judgment that these words formed part of the experiment, or did not form part of it. That is, approximately, according to the testimony of a number of persons, how the reproduction of memory comes about; it certainly seems that direction is its primary condition." (Binet, *loc. cit.*, p. 21.)

Thus emerged the idea of direction which later formed one of the elements in Binet's tentative definition of intelligence and in his scheme of thought. Other psychologists would probably have clung rather to the priority of the whole in this process of judgment. Binet, however, was more interested in describing the essential activities of the individual as activities than in ascertaining what would have seemed to him secondary properties. That he could use this explanation, "the common characteristic of belonging to the same experiment" shows how far removed he was from thinking in terms of associationism. That is not to say that he does not refer to association; he even reports that forming associations with the words aided recall. But an explanation of memory in terms of association would have been incompatible with the paragraph just cited.

Individual differences were studied in this experiment by having both adult and juvenile subjects. The average number of isolated words which an adult could retain and repeat after a single hearing of seven words was 5.7; for children (seven to thirteen years) the number is 4.7. But, say the authors, it may be that if one aroused the child's interest better one would obtain different results; one cannot generalize on the basis of these.

The experiment with lists of words was really only introductory to that with sentences and paragraphs of from eleven to eighty-six words. These experiments were intended to come closer to the problem of the memory of ideas than had any of the previous ones.

It was found that there are small but constant differences in the amount retained according to the age of the subject. Also, a child in a higher grade retains more than a child of the same age in the lower grade. Here are discoveries important for the psychology of individual differences.

The number of words retained varied with the length of the sentences, but this increase occurred in small proportions. Memory was also, in this case, superior by about twenty-five times to memory when isolated words were used. Rather strangely, the explanation of this phenomenon is based on association:

"These differences appear to us to be due to two principal causes. When one recites a series of words or a phrase to a person, one arouses in his con-

sciousness a series of images. In the instance where one has to do with isolated words, they are disparate images which are in no way naturally associated with one another, and which the subject listens to without seeking to associate them; in the sentence, on the other hand, the images are associated with one another, and continuous with one another, perfectly organized. There results that at the time of the memorial act, one has the association of ideas to recall the phrase to him, and this association of ideas does not function, or functions much less well in the recall of isolated words. It is not the only reason for the superiority which memory of sentences shows. When one listens to a series of isolated words, one experiences a curious subjective impression; as fast as one hears a word, one rapidly forms an image; one has hardly time to apprehend this image when one hears a new word pronounced; one is then forced to form a new image which forces out the first from consciousness and very probably has the effect of weakening it. Thus, in a series of isolated words, not only are the images of the words not associated, but they conflict with one another and tend to exclude each other; two reasons why the memory of isolated words should be weak." (Binet and Henri, "La mémoire des phrases," p. 32.)

It is not, however, association by contiguity alone to which Binet refers. It is association based on organization, on continuity of meaning. This explanation is not inharmonious with the discovery that the words which play the most important part in the recital of the paragraph are the best preserved; those which add nothing or are not necessary for the understanding of the sentence are forgotten.

It was found that synonyms were sometimes substituted for the words actually occurring; when the piece to be remembered was short, there were more substitutions of synonyms than there were actual forgettings, but for the longer pieces the reverse was true. Children substituted synonyms belonging to their ordinary language, and so their memorial act is accompanied by an act of translation.

"They impress on the sentence which they make penetrate into their minds the seal of their personality; they make it their own; they give it their habits of thinking; they make it a child's phrase. It is a phenomenon to which one might give the name, in comparing it to what happens in nutrition, of *verballogical assimilation*." (Binet and Henri, *loc. cit.*, p. 52.)

Children tend, for example, to simplify the syntax of what they have heard. They generally use the same synonyms; but they also make substitutions by analogy, and these are peculiar to each child; several children rarely hit on the same word. One will substitute for a noun another which resembles it more or less; another will replace an object by an analogous object which can play the same rôle; another will not change, but will add to the

piece; and another will make emotional changes by exaggerating the feeling expressed in the original passage.

These two articles, then, are important for both general psychology and the psychology of individual differences, for they disclose facts about the process of remembering in general, as well as facts peculiar to certain ages. The differences reported are qualitative more than they are quantitative.

In 1894 began also, with Jaques Passy's collaboration, the investigation of creative imagination (Binet and Passy, "Auteurs dramatiques," *A.P.*, 1894, 1, 60-118). This work resulted more in an outline of psychological types than in an analysis of the process of creation.

The two authors interviewed a number of Parisian dramatists, to find out what they could about the mental states accompanying artistic creation. They found no exceptional condition of mind or body which would distinguish literary work from any other. They never found any of their dramatists resorting to stimulants, tobacco, coffee, alcohol, or haschisch. They found, on the other hand, that literary composition is not a work of imagination alone; there must be a collaboration of reason and common sense with it. There is in the creator at the same time an inspired person and a critic. The true, and the only efficient stimulus to work comes from the subject chosen. All the authors share the emotions of their characters more or less. The work is most often produced during a kind of crisis, a time of varying length during which production is particularly easy.

But the authors do not all go about it in the same way. Some authors attribute to their characters emotions and ideas which are really their own; others try to incorporate themselves in the character which they imagine. Only M. Curel was found to write in a "state of inspiration." Most of the authors imagine the scene taking place before them, in a theater. But though most of them see and hear their characters, the rôle of mental imagery varies; some see only partially; for others the voices may be flat, without sonority. M. de Curel heard distinctly, but his visual images were vague and shadowy.

This article, in which the answers of a number of authors are

reported and compared is a good example of the method which Binet advocated in his handbook. The study of creative imagination through any one of these authors would have given different results from that obtained through a comparison of what they all had to say on the subject. As a result of this comparison, also, it is possible to suggest that imagery plays a less important rôle in thought than had generally been attributed to it.

In 1895, in that same volume II of the *Année* in which appeared the program, appeared also a first attempt to subject emotions and mental work to measurement. (Binet and Courtier, "Circulation capillaire de la main," *A.P.*, 1895, 2, 87-167.) The first intention of the authors was to study the influence of sensations, intellectual work, and emotions on the circulation of the blood in the capillaries—this attack on the problem having been, of course, suggested by the James-Lange theory of emotions. The study proposed is extremely delicate, because of the sources of error both in the method of measurement, and in the peculiar state of the subject. It was found that there were distinct individual differences in the type of tracing obtained on the plethysmograph from different subjects; in a state of voluntary repose some showed an even tracing and others did not. The individual differences were more marked and certain than the differences due to intellectual work or to emotion. From the study of the graphs, for instance, it was not possible to say whether one subject was more emotional than another, but it might have been possible to say to whom the graph belonged. Stimulation by electricity or cold produced a marked effect in some subjects and none at all in others. Similarly with sudden noises, the sudden command, "attention!" etc. With respect to emotion, it was sometimes reported by the subject before the capillary reaction began; hence it is inferred that the capillary reactions are too slow, one cannot account by them for brusque emotions. In the present research again the results fail to be quantitative, but yield qualitative differences.

The investigation was continued nevertheless and filled some 270 pages of the next volume of *L'Année*. Here Binet and Courtier studied the changes in the form of capillary pulse during

different times of the day. They found that the form of the pulse indicated the general state of the organism. Both intellectual and muscular work affected the form of the capillary tracing. In the case of intellectual work, the effects appeared only *after* two or three seconds, indicating that it cannot be a change in circulation which causes intellectual work. Both kinds of work, also, influence the heart and respiration, though in different degrees. The only generalization to be drawn concerning the emotions is that they disturb the rhythm of respiration. Although emotions are thought of as depressive, they always gave evidence of being excitants, and the authors conclude that whatever their quality they are excitants of the nervous system; they provoke vasoconstrictions, and accelerate the heart and respiration.

These studies were deepened with a single subject, M.N., whose capillary tracings showed remarkable regularity. The most important result obtained with him was the tracing of similar graphs for similar emotions at different times. There appeared to be qualitative and constant differences in the form of the tracings for joy, sadness, etc. This leads Binet to believe it possible to draw up a truly physiological classification of the states of consciousness. Such a classification would have been of importance for the measurement of individual differences, since physiological states are more readily accessible than are mental states. But it was with a view rather to the formation of 'natural families of characters' that these researches were undertaken.

While these researches were being carried out with Courtier, with Vaschide Binet was studying the effect of intellectual and physical work on blood pressure. (Binet and Vaschide, "Influence du travail intellectuel, des émotions, et du travail physique sur la pression du sang," *A.P.*, 1896, 3, 127-183.) Binet remarks that probably each reaction—that of the heart, the respiration, blood pressure—has its own significance and is therefore worth investigating. Whereas capillary pulse is in relation with the *quality* of the emotions, blood pressure was found by no means to express anything but the *quantity* of mental phenomena. And "it is by pursuing researches on these different functions that one will be able at the end to know in all its details the ensemble

of physiological reactions which constitute the reverse side of our thinking." (Binet and Vaschide, *loc. cit.*, p. 183.)

In 1897 Binet reported numerous experiments—tests, rather—on dynamometric strength, lung capacity, anatomical measurements, speed of running of a group of young boys. In these, however, he was not trying directly to get at the physiological side of a mental state; the results were used for developing methods of estimating correlation. The dynamometric strength of each boy was used as an index, and the group was ranked accordingly. The first method was to put the students in rank order for one experiment, then put the results of the other experiments alongside. The list is divided into four quartiles, and the average for each quartile is found. If the correlation is high, the differences between the averages of first quartile first experiment and first quartile second experiment, second quartile first experiment and second quartile second experiment, etc., should remain about the same.

The second method was that called "rank method." One test is taken as standard and the results are put in rank order. Then one puts the results of the other tests alongside, and gets the differences between individual sets of results. For perfect correlation these differences should amount to zero. For inverse correlation, the first and fourth quartiles should yield large differences, and the second and third quartiles small ones. But if the average difference for each quartile is about the same, the correlation is zero. After having given a number of tests, Binet added the results together, and used the total as his index in ranking the subjects. He then correlated each of his tests with the total thus obtained. He also correlated with this total the intellectual rank of the student (as obtained from the teacher's opinion) and found only a small correlation.

Binet's ventures into statistics seem to be little known; and indeed, although they were probably intended for finding the correlations existing between faculties, in accordance with his program, he himself did not use them.

Alongside of these almost physiological experiments and these statistical endeavors appear articles of which some fulfill other

parts of the program, and of which some are quite extraneous to it.

In the second volume of *L'Année*, 1895, appeared an article on "Recherches graphiques sur la musique," (with Courtier, pp. 201-222). Rubber tubes were attached, one to each key of a piano, and connected with a large tube which was in turn connected with a kymograph. Graphs were obtained showing intensity, speed, and clearness of playing. But the results were of less value for individual psychology than for the teacher of music.

"Réflexions sur le paradoxe de Diderot" (*A.P.*, 1896, 3, 279-295) attempted to answer the question whether the actor must actually experience the emotions of the character he portrays. The answer seems to be, sometimes yes, and sometimes no. The method here used is again that of comparative observation; the reports of actors are taken, compared, and as it were algebraically summed.

"La psychologie individuelle; la description d'un objet" (*A.P.*, 1896, 3, 296-332) subjects the higher, more complex processes to experimentation. It represents another attempt to classify psychological types through experiments.

The first experiment, with children of from eight to fourteen years, sought to find the orientation of their minds. By orientation is meant the dominance of one faculty over others. This was to be found by placing an object (here, a picture) before the group and asking for a description. The picture arouses different mental processes in each, according to his orientation.

Some subjects described the picture while looking at it, enumerating the objects. They did not include all the objects, and this reduction of the number must be attributed to attention. Others enumerated objects without looking at the picture; they worked from memory, to which is attributable a further reduction in the number of objects named. The reduction is in each case systematic; it is determined by the importance of the objects in the picture. Memory is even more selective than attention; it attaches itself more exclusively to expressive objects, to those which form part of the scene.

The picture used was "Le Laboureur et Ses Enfants," to

which a story was attached. In their descriptions, some children made more use of the story, which they knew, than of the picture.

Binet classed the descriptions into four types: (1) descriptive, a simple enumeration of objects; (2) observant, attending principally to the subject of the picture; (3) emotional, generally with fewer observations than the observant type; and (4) erudite, giving a summary of the story instead of a description of the object. (Those in the fourth class are thought probably to be the work of lazy or dull individuals.)

A similar experiment was performed with eighteen older persons, who were asked to describe a cigarette. The descriptions fall into the same classes, although instead of the emotional type there is now the imaginative type. At this point also, the serious source of error, the subject's desire to do what the experimenter wants, is recognized. Despite that, Binet remained convinced that the four types existed.

Another investigation carried on at this time, which contributed little to the main stream of Binet's work, is such a pretty example of a carefully planned scientific research that it deserves rather detailed attention. This is the study of the influence of intellectual work on the consumption of bread, which appeared in three successive volumes of *L'Année*. ("La consommation du pain pendant une année scolaire," *A.P.*, 1897, 4, 337-355; "Note relative à l'influence du travail intellectuel sur la consommation du pain dans les écoles." *A.P.*, 1898, 5, 332-336; and "Nouvelles recherches sur la consommation du pain dans ses rapports avec le travail intellectuel," *A.P.*, 1898, 6, 1-246.)

This investigation was apparently an outgrowth of the controversy then being waged over whether children were being overworked in school. It was assumed that appetite decreases under the stress of overwork. The best place to study the amount of food consumed by students was a normal school at which they had to board. Moreover, the best food to study was bread, for the amount of meat and vegetables supplied is limited, but the amount of bread is unlimited; if the rest of the meal has been insufficient and the students are still hungry, they will fill up on bread; when they have little appetite, they will eat little bread.

The first investigation showed that the amount of bread consumed decreased steadily from January to June.

The second article replies to M. Blum, who objected to the publication of such data, which were subjected to no control and therefore signified nothing. Binet rejoined tersely that he wanted to know first if there was something to investigate; then he proceeded to investigate it.

His first findings were followed up by recording the menus, the temperature, barometric readings, the mental and physical activities, the fresh or stale condition of the bread, the kind of bread, and the total and average consumption of bread for every day from January through June, again in a normal school.

Each of the factors which might influence the consumption of bread was correlated with it. Only temperature showed a definite correlation; in warm weather less bread is eaten. Department stores which supplied lunch to their employees reported that much less bread was eaten in summer.

The day before an examination more bread was eaten than usually, and on the examination day and the day after consumption dropped below normal. Hence, intellectual work during examinations must diminish the consumption of bread.

When the consumption of bread in June was compared with the consumption on days of the same temperature in earlier months, the consumption is always smaller. Therefore it is thought that temperature is not responsible for the lessening of appetite, which is attributed to the intense intellectual work (always more intense near the end of the school year) that causes an overfatigue. This, in turn, results in smaller consumption of bread.

It is regrettable that before drawing this conclusion Binet did not consider that in June one begins to have the cumulative effect of successive days of heat. It is such a commonplace that in warm weather one eats less, one can put little faith in the results of his careful work.

The suggestions made in the program for the study of suggestion are taken up in 1898, "La suggestibilité au point de vue de

"la psychologie individuelle" (*A.P.*, 1898, 5, 82-152). Suggestion is the moral pressure which one person exerts over another; this influence may be by means of ideas, emotions, or will. Under suggestion, a person suspends his own will and reason to make room for those of another.

Experiments on suggestion were performed with children in the elementary, middle ("moyen") and superior classes. These experiments were of the type described above, of matching lines. Here the suggestion consisted in asking the child if he was sure he was right. An average of 81.5 per cent of the younger children changed their answers as a result, but only 51 per cent of the older children. Suggestibility decreases with age.

A method is suggested for ascertaining the mechanism of suggestion, by studying the conditions in which it works best. If one shows a group of 84 subjects a line five cm. in length, and announces that the next one (which is actually only four cm.) will be longer, only five subjects will make it shorter. But if the experiment is repeated, sixteen make it shorter the second time. Suggestion is less effective the second time; that is one of its limitations.

There are many different kinds of suggestion, however, and not all of them are suitable for experimentation of this kind. The prestidigitator's suggestion, in which his personality is instrumental, the suggestion used in hypnosis, the auto-suggestion induced under hypnosis, none of these lends itself well enough to the kind of experimentation necessary for individual psychology. On the other hand there is the suggestion due to routine which can be experimented on by using repetition in the first part of the experiment, which is then changed without warning to the subject. Thus, one may give the subject an electric shock at a certain point in the experiment for the first few times; he will then continue to feel it although it is not given. Automatism also lends itself to experimentation; the work of Sidis in America is important in this connection. One brings together such conditions that the subject, when placed in them and asked to execute an act of choice, is really forced to choose

in accordance with the desire of the experimenter. For instance, one asks him to pick out one of six cards on a table, and he will pick the one which is in a slightly unusual position.

This article is related primarily to the psychology of individual differences, but it also contains the nucleus of the psychology of testimony, as it shows how easily the witness may be made to answer altogether incorrectly or in accordance with the desire of the questioner.

The experiments resumed in "Attention et adaptation" (*A.P.*, 1899, 6, 246-404) again attack individual differences, from a different angle. They look for the qualitative differences between the intelligent and the unintelligent in certain simple processes, such as the determination of the two-point limen. They deal basically with attention, though other processes are of necessity involved.

The subjects were the five most intelligent and the six least intelligent members of a class of thirty-two, as judged by their teacher and the principal.

The first three experiments, on tactal sensitivity, showed that the intelligent children were at first decidedly superior to the unintelligent; but in subsequent trials the intelligent did about the same as they had done at first, whereas the unintelligent improved and came up to the level of the intelligent. They simply adapted less quickly than did the intelligent. In counting rhythmic sounds, the unintelligent made on the average more than twice as many errors as the intelligent. Their memories were tested by giving them groups of numbers to copy; the experimenter counted the number of times each subject had to look at a group in order to copy it. When there were fifty numbers in a straight line, the intelligent copied more at a time than did the unintelligent. An analogous experiment was tried with sentences. Here again the intelligent were superior, but the differences diminished for the second sentence. Again the leveling of performance is attributed to a slower adaptation on the part of the unintelligent. When the results were analyzed, it was found that the intelligent more often copied whole phrases and made breaks at logical points in the sentence, whereas the unintelligent made their breaks at

illogical points. The intelligent were superior also in copying a drawing.

Galton's experiment on maximal memory was repeated: to find the greatest number of letters which the subject could retain after reading them for twenty seconds. Chance was important in the results of this experiment because the subjects were not required to report the letters in their exact order. There was little difference between the two groups. Conversely, also, a long number was shown to the subject through a tachistoscope as many times as necessary for him to learn it. The intelligent required an average of 6.4 exposures, and the unintelligent, 10. The intelligent generally prove to be superior in memory.

In reading material exposed for short times the groups were about the same. When it was a drawing that was exposed there was a marked distribution of the results, but these are unfortunately not measurable; the errors made cannot be objectively evaluated.

There was a reaction time experiment involving choice, in which the warning signal was omitted; this required closer attention on the part of the subject. At first the intelligent made more errors than did the unintelligent; the errors of the unintelligent were about equally distributed throughout the experiment; again they adapted less quickly. The experiment shows that in complex reactions differences between the two groups begin to appear.

In counting series of little dots, the unintelligent made more mistakes than the intelligent. This superiority is the more curious as the operation demands more care than true intelligence.

All these experiments Binet considers to involve voluntary attention—the mental adaptation to a state which is new to one. There has been no attempt in this article to analyze the many complex functions involved in each experiment; only the results are retained:

"It is important only to remember that with very few exceptions, the difficulties of our experiments are not intellectual difficulties, involving the ability to comprehend; they are not at all problems to be solved; and it is by this characteristic that our experiments differ from all those which one might make to evaluate the intelligence of a person, experiments of the type represented by

the explanation of an abstract sentence." (Binet, "Attention et adaptation," p. 394.)

Nevertheless the performance of the tasks set depended, not on the good will of the subjects, but on their mental constitution. Some performances proved really useful in differentiating the two groups. They are all rated in this respect—and it is curious that only one of them—the test of memory for figures, reappeared in the scale.

But of equal importance with this discovery of useful tests is the conclusion that mental adaptation takes place differently in the two groups, and that as the unintelligent practice the difference between them tends to disappear. For adaptation also came to take its place in Binet's scheme of thought and theory of intelligence.

Perhaps it was his success with the experiments on tactal sensitivity in "Attention et adaptation" that led Binet to use the same method for studying distraction. In the same volume appears "Recherches sur la sensibilité tactile pendant l'état de distraction" (*A.P.*, 1898, 6, 405–492). These experiments are similar to those performed with hysterical patients, whom he had perform automatic movements while doing some mental task. Here his subjects were asked to perform tasks of mental arithmetic while Binet applied the esthesiometer and asked for reports of one or two points. Under these conditions, of course, their errors increased.

The study of esthesiometry continued. The articles on that subject in 1900 were technical, and are not of interest here. The experiments reported in 1903 served again to draw up a set of psychological types, on the basis of different forms of results. In the case of some observers the limen occurs very definitely at a certain point; above this point they always report two, and below it, one. These are the "simplistes" for whom the matter is clear-cut; they know how they wish to classify each sensation. There are others who hesitate over some sensations, not knowing whether to call them one or two. These subjects are called "interprateurs;" for them the limen covers a range. The "distraite" is a subject who talks a good deal during the experi-

ment. This classification is made with the help of the introspections of the observers.

Just as in "Attention et adaptation" Binet had constructed tests which differentiated the unintelligent from the intelligent, so in the following year he tried to differentiate between them by means of their cranial measurements. (See the several articles in *A.P.*, 1900, 7.) He had two groups of intelligent and unintelligent subjects whose heads he measured in some seven different ways. The averages of the measurements for the two groups were about equal; but, unwilling to let it go at that, he analyzed his data and found that though the heads of the intelligent were mostly of average size, among the unintelligent the size of the head tended to be either smaller or larger than the normal. There were also found two diameters of the head which were usually larger in the intelligent subjects, but this difference was on the average only three or four millimeters.

In the following year (see *A.P.*, 1901, 8) these cephalometric measurements were continued to find significant changes in measurements according to age, and also to find if there were any characteristic differences in the dimensions of the heads of the blind and of deaf-mutes.

For the first problem he divided a group of twenty children into two groups, one of children from six to ten years, and the other from ten to sixteen years. Supposedly these two groups were pre- and post-pubertal. Binet attributes the fact that he found nothing, quite plausibly, to the excessively small number of subjects.

Measurement of deaf-mutes and blind children of various ages revealed that they both have wide heads between the ages of five and seven. There follows a gradual diminution in the relative size of the head, and after puberty they are microcephalic.

Cephalic measurements yielded little for the psychology of individual differences. Binet did not continue these studies further, nor did he give them up; he encouraged other members of the "Société libre pour l'étude psychologique de l'enfant" to continue them.

Two other articles of this period should be reported in this

chapter: "La création littéraire. Portrait psychologique de M. Paul Hervieu" (*A.P.*, 1904, 10, 1-115) and "La graphologie et ses révélations sur le sexe, l'âge, et l'intelligence" (*A.P.*, 1904, 10, 179-211).

The portrait of M. Hervieu, drawn for the benefit of individual psychology, showed him as a self-controlled, logical author, quite conscious of acting voluntarily while writing, as opposed to authors who have a feeling of incarnation, of automatism, and the like—authors whom Binet labels "instinctive."

The study of graphology put that art to a crucial test. One hundred and eighty envelopes, most of them addressed to Binet, were submitted to two graphologists for the determination of the sex and age of the writer. Their answers were about 75 per cent correct. But when several persons ignorant of graphology also examined the writing they made out almost as well.

For the determination of intelligence by examining handwriting, Binet procured documents by persons of recognized intelligence or stupidity, but of neutral content. The graphologists in this experiment made only three, five, or six errors. Binet concludes that graphology may be able to furnish experimental psychology with a test of intelligence—if given a chance.

Several books were published also around this time. *La suggestibilité* is a handbook on suggestion, and adds little to Binet's articles on that subject. *Le travail intellectuel* also does not add much to the discussion of mental work.

*L'Étude expérimentale de l'intelligence*, on the other hand, is an important contribution to individual psychology and to general psychology as well. Although the experiments were begun in 1901, the book was not published until 1903. It represents the greatest of Binet's attempts to study mental states by simple means, and also his most complete and careful attempt to characterize psychological types in accordance with the results of tests.

His subjects were his two daughters, trained by now to intelligent participation in experiments. He could not only observe them as he always did observe his subjects (attitude, emotional state, etc.) but he could also depend on their giving complete reports.

The most important of his twenty experiments were those in which he had the subjects write a list of twenty words, and those in which he asked them to report the image occurring at the sound of the word he spoke. Analysis of the words included in the lists threw light on the personality of the subject, for the words in Armande's list showed that her imagination was turned rather inward, that she was detached from the external world, whereas Marguerite showed, when her lists were analyzed, a practical personality concerned with concrete things in the external world. The imagery reported by the two girls showed analogous differences; that of Armande was much less precise and vivid. The same tendencies appeared in other tests of memory or of giving descriptions.

When the results of all twenty tests were taken together, they showed for Armande: detachment from external world, imaginative development, frequency of vague ideas, aptitude for verbalism, attention directed toward internal world, complex ideas, observation not very well developed, whimsical ideas, complex modes of association of ideas, memory of past events sometimes dominating over the present, rather unsystematic development of ideas, tendency toward reverie, poetic spirit. For Marguerite the tests yielded an equal number of descriptive phrases, such as: attachment to external world, observant spirit, good literal memory, simple ideas and modes of association, practical spirit, preoccupation with self, little aptitude for reverie. From all this mass Binet wished to sort out a common factor, what he called a "ruling faculty." This common factor would have been a tendency to react in a certain way. He had to find a description for each of his daughters that would harmonize with, perhaps account for, all the descriptive terms which he had amassed. The best he could do was, stability for Marguerite, variability for Armande. But he dropped the attempt because though "there is in all this much truth . . . they are labels and not explanations; it is a literary game rather than science." They do not explain the personality. But though Binet considered that he had failed in his attempt to describe the ruling faculty of his daughters, he did describe the method of testing personality by an assortment of

heterogeneous tests. It is the first intelligence test as we now understand intelligence tests, except that it dealt, not with the degree of intelligence, but with the kind.

At the same time these experiments threw light on the nature of the thought process. It had until this epoch been assumed that thought proceeds by means of associations of images; the matter had not been put to the test. Binet himself had taken it for granted in his *Psychologie du raisonnement*. Now, when he stopped to ask what images accompanied thoughts, he found that sometimes there was no image at all; sometimes there was an image which had nothing to do with the thought; and usually if there was an image it was not coextensive with the thought. (E.g., the image of a green field to accompany the thought of going to the country is not coextensive.) All this supports the statement of Mr. Forsyth (see above, page 36) to the effect that thought does not take place by means of imagery. It is unnecessary to point out the controversy which arose with the Würzburg school over the priority of this idea. Binet explored the concept further with the feeble-minded in 1908. It not only refuted associationism, but led him in the direction of a substitute for that. This will be seen in the next chapter.

The lists of twenty words showed "themes," or groups of words about different ideas. There would be a distinct break in the continuity of the list when one theme ended and another was introduced. This also contributed to the knowledge of thought, though here the revelations are less novel:

" . . . According to the teachings of the English school, association of ideas would be the key, the final explanation of all mental phenomena. . . .

" Taine made quite clear what is automatic, extraneous to our thought in this process, by employing this formula to explain the reproduction of ideas: 'An image emerges when it has already begun to emerge.'

" In this Taine remained true to his fine theory of intelligence, so similar to a clock-work mechanism, where attention itself is reduced to an intensity of the image. I cannot here treat the question with the fulness which it deserves; I wish only to show in passing that the existence of themes of thought is inexplicable by the automatism of associations; for, on the one hand it happens, in Marguerite's series, that the transition between two words, although accomplished by a conscious association of ideas, does not prevent the subject from observing that there was at this point a change of ideas, that is to say the appearance of a new theme, a fact which association does not explain; and, on the other hand, when words are inspired by a single theme, they cannot be given by the bare play of the association of ideas; for a theme to develop, a selection

of ideas, a work of choice and elimination is necessary which by far surpasses the resources of association. This association is intelligent only when it is directed; reduced to its bare capacities it uses any resemblance, any contiguity whatsoever; it can thus produce only incoherence; and at most it might explain the succession of words of a maniac or the kaleidoscopic images of reverie." (Binet, *op. cit.*, p. 69.)

This diatribe recalls the criticisms launched against associationism in *Les altérations de la personnalité*, yet this time Binet is noticeably more constructive; he points out not only the inadequacy of associationism, but also the direction in which to look for improvements on it. Association must be *directed*, as the experiments on memory had already shown. In the conclusion Binet states explicitly, also, that in generalization it is the *intention* (the direction) which constitutes what is general, not the image. It was not until 1911, however, that any psychological description of direction or intention was attempted; until then they remained words which seemed to express the idea of a force at work. In that year they were described as attitudes, and so any idea of their being faculties, or agents of any kind, was thoroughly dissipated.

*L'Âme et le corps*, the last work to be included in this chapter, hardly belongs in this thesis at all, for it is a philosophical, not a psychological treatise. Its interest for a discussion of Binet's psychology lies in seeing how he harmonized his philosophy with his psychology.

The main problem of the book is to explain how it is that we are conscious of things that happen outside of ourselves, but are yet not conscious of the events going on in our brains, the events through which we become conscious of the outside world. Binet argues that sensations are material, and that consciousness is neither an act nor an agent, but a state of mind *reflecting* the state of the body. Consciousness tends to disappear under the influence of habituation, and that is why we are unconscious of what goes on in our brains; we are more habituated to those events than to any others. This treatment of consciousness it is that leads him to make the following statement:

"From this we come quite naturally to see in the intelligence only an inactive consciousness; at one moment it apprehends an object, and it is a perception or an idea; at another time it perceives a connection, and it is a judgment; at yet

another, it perceives connections between connections, and it is an act of reason. But however subtle the object it contemplates may become, it does not depart from its contemplative attitude, and cognition is but a consciousness." (Binet, *L'Âme et le corps*, Ed. F. Legge in International Scientific Series, London, Kegan Paul, 1907, p. 117.)

Intelligence is here identified with consciousness; and so, though it is not part of psychic phenomena—does not motivate thinking, for instance—it is involved in all of them. That is altogether harmonious with Binet's earlier statements concerning intelligence. It does not explain, however, why differences in intelligence are more apparent in the higher mental processes than in the simpler ones. If intelligence is consciousness, then does that mean that the more complex activities require a greater degree of consciousness (bearing in mind that consciousness does nothing but reflect a bodily state)? Probably at this time Binet himself could not have answered this question; he had not yet begun to formulate clearly the meaning of the word "intelligence."

This chapter has of necessity seemed helter-skelter in character. Binet laid down the program for individual psychology in 1895, and himself set to work to carry it out. There were two aspects to the program, the quantitative and the qualitative. Binet concerned himself with both.

Quantitative researches, let it be emphasized, were not to be introduced into psychology in order to render that a precise science, like physics. Quantitative discoveries were to be made, because they might afterwards be instrumental in establishing qualitative phenomena. A knowledge of the norms for various abilities is prerequisite to investigating the relationships between or among abilities in the individual. Eventually it would be possible to find out whether the development of one ability entails development of another, or whether there is no relation between the degree of development of different abilities in the same individual. Measurement is used as a tool in investigating the nature of human abilities.

To quantitative psychology, during this time, Binet contributed his experiments on memory (which, like all his quantitative studies, are in part qualitative); his studies of capillary circulation and pressure, which in part, at least, aimed to subject emo-

tions and mental work to measurement. The experiments on suggestibility also lend themselves to evaluation. Using his tests of muscular strength, Binet developed statistical methods. And he laid down the conditions for setting up an experiment that should yield quantitative results.

Yet Binet never went so far as to use the correlational method which he had advocated in the program. Except in those experiments in which he found the correlation between intelligence and particular processes, such as counting little dots, he did not try to find the correlation between the degree of development of two different abilities.—And one cannot suppose that he was here considering intelligence as an ability, since for him intelligence was something involved in all psychic phenomena. It would be more accurate to say that in these experiments he sought abilities which correlated highly with the sum total of all abilities. And at the same time he was looking for the peculiar way of reacting of both the intelligent and the unintelligent. His quantitative studies (in "Attention et adaptation") did lead to the discovery of the importance of adaptation in intelligence, and so they do furnish an example of the establishing of a qualitative fact through quantitative investigations—though this did not come about in the way prescribed in the program.

The program stressed, on the qualitative side, "families of characters," that is, different *kinds* of intelligence (personality). This part of the program really claimed more of Binet's attention than did the other. His aim was to classify individuals, through experimentation, into types; emotional, intellectual, stable, unstable, or whatever other types he might discover. By thus grouping together individuals who are alike, it would be possible to find the laws which hold true for a group but which are not necessarily true for other groups.

The studies of capillary pulse and pressure were directed also toward discovering emotional types, though in this they were not successful. Another attempt was made through the observation of a number of authors. The description of an object did result in a classification of four types; here it was assumed that one faculty ("faculty" is here used almost synonymously with

"attitude") would dominate over the others, and the subjects were classified in accordance with the faculty which seemed to dominate while they were giving their descriptions. In the experiments with the esthesiometer the subjects were grouped into types according to the kind of answers they gave. These classifications were based on the results of a single experiment; but Binet had recognized (in "La description d'un objet") the necessity for using a number of tests in order to have a check on errors arising from the subject's attitude or the inadequacy of the test; in *L'Étude expérimentale de l'intelligence*, therefore, he used twenty tests, and based his descriptions of two types on the way in which these tests bore each other out. The subject's psychological type is determined by the common element running through her responses to all the tests. The tests are, as it were, so many search-lights played upon the personality of the subject, to find out what is its "ruling faculty." This book brings together the first "battery" of tests on the complex processes aimed at discovering one particular fact.

Beginning in 1894, when he founded *L'Année psychologique*, Binet was free to write as profusely as he pleased. Thereafter he employed the method of "comparative observation" in combination with objective experimentation, which contrasts sharply with his earlier works, in which he rarely reports any comments from his subjects. It was by this new method that he arrived at the concepts of *direction*, and of imageless thought, which determined the nature of the system of psychology which he finally planned in 1910 and 1911.

During this period, also, Binet shows himself much more practical than he had been before. Perhaps this is the inevitable concomitant of ceasing to theorize. His interest in pedagogy grew constantly, but it always took the form of investigating psychological facts which would have a general rather than a particular significance for pedagogy, such as the memory of children of various ages. His studies of mental fatigue, of suggestibility, of graphology, have implications for pedagogy. In 1900, with Ferdinand Buisson, he founded the "Bulletin de la société libre pour l'étude psychologique de l'enfant;" and he took so

active a part in that organization that after his death it became the "Société Alfred Binet." His interest in applications of psychology to the law also continued; he was proud of being able to claim that in his 1898 article on suggestibility he founded the science of the psychology of testimony.

From 1894 or 1895 to 1904 Binet's work continues steadily along, mostly in accordance with a preconceived plan. What would have been its culmination, had its course not been interrupted, is hard to say. It would probably have had to do with the nature of intelligence, and it is more than possible that it would have included a system of psychological types. Possibly, but not very probably, the scale would have been invented even if Binet had not been called upon to devise a means of measuring intelligence. This call presented him with new problems, providing him, after the scale had been invented, with a new tool for use in his investigations, and brought him face to face with new possibilities (in the form of the feeble-minded and the insane) for the investigation of intelligence. Hence the necessity for inventing a scale for the measurement of intelligence gave a new and decisive turn to Binet's psychological work.

## CHAPTER IV

### THE INVENTION OF THE SCALE, AND ITS USE. THE EVOLUTION OF A NEW SYSTEM OF PSYCHOLOGY

In 1904 the Minister of Public Instruction in Paris appointed a committee, of which Binet was a member, to find a method for separating the subnormal children in the schools from the normal. This task gave an immediate and definite goal to Binet's work. He must drop the study of psychological types, and concentrate on distinguishing the feeble-minded from the normal.

His first step was to assume without hesitation that the difference is one of intelligence. Whether the feeble-minded differed from the normal in the amount of their intelligence, in its quality, or by the lack of some part of intelligence, he could not yet say. In assuming, however, that the difference lay in the intelligence, he immediately defined his problem. It became a psychological problem, which involved the determination of the individual's intelligence.

A good part of the eleventh volume of *L'Année* (1905) is devoted to a historical account, and to an analysis of the methods which had been or which could be used in investigating feeble-mindedness, and of the definitions which had been given. Pinel, Esquirol, and the other authorities had never clearly stated whether the problem was one for medicine, pedagogy, or psychology; and scrutiny of their classifications of idiocy, imbecility and moronity revealed such vagueness and such overlapping that Binet was moved to express his impressions in the most biting sarcasm. It was said, for instance, that in idiocy "the attention is fugitive," while in imbecility "the attention is fleeting." Binet confessed himself unable to grasp the distinctive shade of meaning. In idiocy "there is a gleam of intelligence;" in imbecility "the intellectual faculties exist in a very incomplete degree." But the difference between these two states of the intellectual faculties is not defined. And similarly with the other symptoms

listed. The essential characteristic of these subnormal states had not been separated out; only altogether inadequate lists of symptoms had been given.

Discussion of each of the methods: medical, pedagogical, and psychological, reveals that only the last is satisfactory, and also that it is the one that was least used until 1904-5. The medical method, which would classify these states in accordance with physiological symptoms, had shown itself inadequate. There might be certain physical conditions accompanying feeble-mindedness which would be of aid in a diagnosis, but a diagnosis cannot safely be based on them alone. The pedagogical method, which employs the child's position in school, the amount of instruction which he has imbibed, is a useful but not an infallible guide. Retardation in school may be due to poor physical condition, or to some other cause not necessarily related to mental deficiency. The best method, the one really appropriate to the problem, is the psychological method, which actually attempts to measure the intelligence.

One real effort had been made in this direction, by Blin and Damaye. They had drawn up a test consisting of twenty "themes," upon each of which the subject was to answer some ten questions. The themes were graded in order of difficulty; the first tests had to do with outward appearance, carriage, etc., and the last demanded fairly complicated reasoning. Here are a few samples:

"'What is your name?' . . . 'When were you born?' . . . 'Are your parents living?' . . . 'What do they do?' . . . 'Put your finger on your left eye.' . . . 'Go to the wall and come back here.' . . . Experiment with little dots. . . . Name objects shown: key, pen, pencil, etc. . . . 'What color is this pencil?' . . . 'Are you less thirsty when it is hot than when it is cold?' . . . 'What time is it? Is a week longer than a month?' . . . 'Is Brittany in France?' . . . 'What do soldiers have on their heads?' . . . Questions on reading, writing, spelling, and arithmetic. . . . 'What is the difference between the Catholic religion and the Protestant religion?'" (Binet and Simon, "Sur la nécessité d'établir un diagnostic scientifique des états inférieurs de l'intelligence." *A.P.*, 1905, 11, p. 177.)

These excerpts show the variety which Blin and Damaye used in attempting to rate intelligence. They restricted themselves neither to a single type of test, nor to psychologically simple

tests. The gradation of difficulty in the questions was useful in bringing out differences in intelligence.

Binet praised this scale for its use of the psychological method, but criticized it for its *a priori*, subjective character. The twenty themes were chosen altogether arbitrarily, and the rating of the subject's performance was altogether subjective. The examiner gave the subject a score for his performance on each set of questions as a whole—there was no weight assigned to the particular questions. A low score might indicate probable mental deficiency, but because of its subjective character, it could indicate nothing more precise than that.

The method which Blin and Damaye should have used, and which Binet and Simon did use, is essentially the method used in such studies as "Attention et adaptation." There Binet looked for tests which could be rated objectively, and which possessed demonstrated value for differentiating the unintelligent from the intelligent. The probable error of the diagnosis must, of course, be reduced to a minimum; and it may have been this necessity, or it may have been the example of Blin and Damaye that led Binet and Simon to base their diagnosis on the results of a large number of tests. In any event, the bringing together of a battery of tests for determining the amount of intelligence was not altogether novel; Binet had done the same for determining its kind.

Accordingly, the article, "Méthodes nouvelles pour le diagnostic du niveau intellectuel des anormaux" (*A.P.*, 1905, 11, 191–244), exposes a series of tests which Binet and Simon had found useful in differentiating between the normal and the subnormal. These thirty tests are not new, but come from many sources. Binet had already used many of them before. The tests requiring execution of simple commands, the coördination of movement of head and eye, prehension provoked by a tactile or visual stimulus, the recognition or quest of food, are to be found in "Recherches sur les mouvements chez quelques jeunes enfants," in 1890. The article on "Perceptions d'enfants," also in 1890, contained the tests on verbal knowledge of objects and ability to define words, knowledge of pictures, designation of objects. The child's ability to compare lines was discussed in

"Perceptions de longueurs," in the same year. One of the many tests in "Attention et adaptation" is retained, the repetition of a group of figures. The test of suggestibility had been described by Binet in the *Revue philosophique* in 1894. The sentence completion test was taken from Ebbinghaus. These tests, along with many others, had been applied by Binet and Simon to normal children, and to subnormal children at the Salpêtrière. The responses of the two groups had been rated as objectively as possible, and those tests had been retained which the intelligent usually answered correctly, and the subnormal were unable to answer, unless absurdly.

These were tests of intelligence, of course; but in 1905 Binet had still only a general idea of what he meant by intelligence. It was consciousness. It was something measurable through the higher processes. But then, how does the intelligence of the idiot differ from that of the imbecile, and that of the imbecile from that of the moron, and so on. It was impossible to say. Not only was the exact nature of intelligence unknown, but so was the precise definition of each of these states. The differences between them and the normal states could be indicated only in terms of their performances on the tests.

Nevertheless, in introducing this new method of diagnosing feeble-mindedness, the authors felt the need of explaining what it did. The reasoning which led to the invention of the scale had been intuitive; now, logical reasons must be found for explaining and defending what had been sensed. They explain, therefore, that they are measuring the intelligence of the individual; but it is unnecessary to measure *all* of his intelligence. There is in the intelligence an "essential faculty," judgment, which is the *sine qua non* of normality; and presumably they mean that the more one is lacking in judgment, the more one is feeble-minded:

"Nearly all the phenomena with which psychology concerns itself are phenomena of intelligence; sensation, perception are intellectual manifestations as much as reasoning. Should we therefore bring into our examination the measurement of sensation after the manner of the psycho-physicists? . . . A slight reflection has shown us that this would indeed be wasted time."

"It seems to us that in intelligence there is a fundamental faculty, the alteration or the lack of which is of the utmost importance for practical life. This faculty is judgment, otherwise called good sense, practical sense, initiative, the

faculty of adapting one's self to circumstances. To judge well, to comprehend well, to reason well, these are the essential activities of intelligence. A person may be a moron or an imbecile if he is lacking in judgment; but with good judgment he can never be either." (Binet and Simon, *loc. cit.*, p. 192.)

Accordingly, they say, the tests in the scale are designed to test judgment:

"In the scale which we present we accord the first place to judgment; that which is of importance to us is not certain errors which the subject commits, but absurd errors, which prove that he lacks judgment. We have even made special provision to encourage people to make absurd replies. . . . One cannot make tests of judgment on children of less than two years, when one begins to watch their first gleam of intelligence. Much is gained when one can discern in them traces of coördination, the first delineation of attention and memory." (Binet and Simon, *loc. cit.*, p. 196.)

(In other words, if judgment cannot be tested, attention and memory may serve as substitutes.)

In the exposition of the scale, however, few of the thirty tests are described as tests of judgment. Some are accompanied by a veiled confession that one cannot say what they are testing (*e.g.*, test 10, comparison of two lines of unequal length). Others test vocabulary, ideation, or observation. The resulting impression on the reader is one of inconsistency and vagueness, as if the authors were not quite sure of what they were doing.

Most probably they were not. True, they are justified in saying that the tests are intended to test judgment, because they rated the answers, when possible, according to the judgment they showed. But their remarks are based more on subjective observation than on objective evidence. They had a general idea of what they thought should be done; it was to be a matter of years before they would be able to reduce this general idea to another, less vague and more specific.

Both the practical and the theoretical researches required by the scale were continued during the remainder of Binet's life. On the practical side, the work of standardization was perfected; in 1908 and 1911 two revisions were published, with the addition of new and the elimination of some old tests. In 1911 the method of standardizing was also improved; tests were now chosen when there was a more or less gradual increase in the number of children of succeeding ages who passed them. The form of the scale was also improved. In 1905 the tests were simply ranked in

order of difficulty; there was then no way of describing the child's success beyond the number of tests which he could pass. When the scale was revised, the tests were grouped according to the age of the normal child who could pass them. Thus, a child of three years should be able to point to nose, eyes, and mouth; repeat sentences of six to ten syllables; repeat three figures; and enumerate the objects in a picture, besides knowing the family name. The child of four years should be able to pass tests of somewhat greater difficulty. This method allows one to describe the child's intelligence as equal to the average intelligence of children of three years, or of the age level which the child comes up to on the tests. This is a practical application of the idea of mental level, or degree of mental development, which Binet had suggested in "Perceptions de longueurs" in 1890.

This method also allowed a more precise definition of the states of feeble-mindedness. By 1910 Binet described the idiot, for instance, as an individual whose intelligence never passes that of the average two year old child, and who can perform certain simple tasks; he communicates with other persons only by gestures. The classification is given below:

Degree of retardation	Intellectual development compared to that of a normal child.	Social relations with other persons.	Nature of the tasks which these individuals can accomplish.
Idiot	Development of 0 to 2 years.	By gestures.	Grasp an object presented, walk, sit down, get up, etc.
Imbecile	Development of +2 to 7 years.	By speech.	Eat alone, dress, wash hands, keep clean, sweep, make a bed, shine shoes.
Moron	Development of +7 to 12 years.	By writing.	Comb hair, garden, wash, iron, make a hem or a darn, cook an egg or an onion soup.

(From Binet and Simon, "L'Arriération." *A.P.*, 1910, 16, p. 353.)

These practical questions, however, were rather routine matters. Theoretical problems arose, which gave a turn to Binet's investigations quite different from that which he had been following heretofore. In the first place, it was obviously necessary that he clarify his conception of intelligence. In the second place, the contact with the feeble-minded had evidently suggested to him how much more valuable it would be, instead of confining his researches to normal subjects, to approach his subject through those whose intelligence is in some way abnormal. By finding out what is lacking in the feeble-minded or the insane individual, he gained clues as to what constitutes intelligence in the normal person. The tests which he had standardized furnished him with an excellent instrument, since he now had a basis for comparison of different performances, and a means of quantitative evaluation as well.

The first refinement of the definition of intelligence appeared in 1908, along with the first revision of the scale (Binet and Simon, "Le développement de l'intelligence chez les enfants," *A.P.*, 1908, 14, 1-94). It was a negative kind of definition: memory is *not* scholastic *aptitude* (Blin and Damaye had been accused, in the 1905 article, of measuring school training rather than intelligence). Scholastic aptitude is little more than memory, whereas intelligence is much more than that. The claim is not made that the tests measure intelligence in its pure state and succeed altogether in escaping the influence of scholastic training; but there are tests in which a superior child will shine and which have nothing to do with training (*e.g.*, paper cutting test). This same intelligent child may fail in school because he refuses to pay attention, or because he lacks interest in the class. Evidently all scholastic aptitude is not intelligence, and all intelligence is certainly not scholastic aptitude. That is the first distinction to be drawn.

A second distinction is drawn between a mature intelligence and an intelligence which has not grown as it should. This is called the distinction between *maturity* and *rectitude* of intelligence. The maturity of the intelligence is its growth with age; an intelligence which does not mature remains childish. Maturity prob-

ably consists in part in the development of judgment and comprehension; it also consists in acquisitions. An immature intelligence may be described in terms of what the tests, say of six years, require of the child. And the change in the intelligence which comes with maturity may be illustrated in the change that comes about in the explanation of a picture: the very immature intelligence merely enumerates objects; a more mature intelligence describes the picture; and a still more mature one interprets it. Rectitude, or correctness of the intelligence is independent of maturity; a subject may show maturity by interpreting a picture, and also show a lack of rectitude by interpreting it foolishly.

These two distinctions are based on results obtained with the tests; results simply showed that a child might be bright, but backward in school, or he might show maturity by the kind of answers he gave, and at the same time make gross errors in those answers. But Binet made a much more systematic investigation into the nature of intelligence in the following year. This was published in 1909 under the title, "L'Intelligence des imbeciles" (by Binet and Simon, *A.P.*, 1909, 15, 1-168). This investigation aimed first to find whether any specific ability were lacking to the feeble-minded, which it did by correlating a number of abilities (or processes) with different degrees of intelligence. Subsequently, the way the feeble-minded went about answering a question (his attitude during the test) and the kinds of answers which he gave were compared with the attitude and answers of normal subjects; from these specific facts generalizations were drawn which led to a theory of intelligence.

Character proved to be unrelated to degree of intelligence, for an imbecile may be either rebellious or docile. Tests of attention, however, do show a positive relation. There are four possible degrees of attention:

1. The attention of a subject can be awakened and fixed upon a certain point.
2. Once attracted, this attention can be held for a certain time.
3. If this attention is diverted by a distraction, it can return spontaneously to the object which it quitted.
4. It can even resist the cause of distraction, and remain fixed

upon the object, in spite of all the influences which would turn it aside.

The first degree of attention, but not the second, is found in idiots. The idiot Vouzin would not remain attentive even to food. The imbecile passes the second degree of attention, and looks like a well-behaved pupil; his attention is not spontaneous. The third and fourth degrees of attention pertain to normal and higher intelligence.

The imbecile shows himself incapable of voluntary effort. This defect showed itself in motor tests, as reaction times; and in psychological tests, as naming as many words as possible or repeating digits.

A very marked relation was found with movements as exemplified by writing: the idiot can trace only planless scratches; as the intellectual level rises the writing becomes regular lines, lines approximating letters, and finally actual letters. This evolution, says Binet, parallels the evolution of thought, from the vague to the definite.

For perception of weights the feeble-minded are almost on a par with normal persons. They are not, however, very sensitive to pain.

Their attitude in an experiment on free association is much calmer, less embarrassed than that of a normal person. They do not question what they are doing; they simply repeat the word given or prepare words in advance. This cuts down their reaction times. Only the very low grade can be distinguished by the nature of their responses.

The "activity of intelligence" is not related to intellectual level. Cabussel, who does no better than the sluggish Albert on the tests, nevertheless talks a great deal and gives the impression of intellectual activity. Among normal persons, too, one finds individuals who abound in opinions despite the low level of their mentality.

The feeble-minded can count from one to ten, but cannot apply their counting to objects. They do have a number sense, however, for when Binet repeated the experiment on number already reported in 1890, showing them a number of objects and then

producing them again one by one until the subject said "There are no more," the answer was given correctly until there were more than seven objects.

They show no penetration in their reasoning. Although they are so much older, like children they describe a picture by merely enumerating objects, and define objects by giving their use.

They are suggestible, though it is hard to tell where their true suggestibility ends and their desire to please the experimenter by doing as he says begins.

They cannot reconstruct a rectangular visiting card from ten fragments, find rhymes, or construct a sentence containing three given words. For they cannot adapt themselves to the difficulty of filling a frame by the trial and error method. After a failure, they sit motionless, and do not try again.

In sum, feeble-mindedness is not a malady affecting any specific process. The defect is general, involving all the processes to some degree.

From here Binet went on to the second part of his problem. So far he had obtained a static picture of the conditions existing in the feeble-minded. He then went on to explain how this intelligence works. 'Un schéma de la pensée,' one of the chapters in this article on the intelligence of imbeciles, is dynamic in its purpose; and it does succeed in showing the intelligence at work.

The theory is based on diverse and apparently unrelated observations. The first of these concerns the nature of thought.

Experiments with the feeble-minded Denise, who could speak only a few words, but who could nevertheless express a complex idea in a single word, lent substantiation to the theory of imageless thought. So did the man who suffered from aphasia, but who could also express a complex idea in the two words, "That—no!" The theory of imageless thought is fundamental in Binet's scheme.

Thought is said to be composed of three distinct elements: a *direction*, an *adaptation*, and a *criticism*. These three elements characterize a complete thought, but they may be lacking in an incomplete thought.

The *direction* (which it will be recalled was mentioned first in the experiments on memory, in 1894) is the directing idea, the *Aufgabe*. Now, in the experiments which Binet had just performed with imbeciles, to examine the nature of their intelligence, he found that the direction is often weak in them. (Binet in the 1894 article identified direction with attention. He has just shown that where intelligence is low, attention is also low.) It may be that the direction once begun does not continue; the subject is easily distracted. Or else the feeble-minded subject does not even understand the direction, and so it has never begun. Thus, one of the first characteristics which distinguish a superior from an inferior intelligence is the power of the direction of the thought; and this power manifests itself in two ways: by its complexity and by its persistence. Whereas it was more fashionable to give first place to isolated ideas, images, movements, Binet gave to it a coördination which directed the course of ideas. The idiot is inattentive because he cannot coördinate, cannot direct.

The element *adaptation* describes the progress which takes place in thought. This is ordinarily called *choice*, the choice of one of the many states or ideas which present themselves. It presupposes, of course, that a great many ideas do present themselves. But there is an evolution: the first states through which one passes are vague, undetermined, whereas the last states are more precise, and more determined. Thought makes things precise; it gives individualization to what had lacked it. This process of changing an originally vague and general idea to one that is precise and specific constitutes the adaptation of means to end: a particular, precise thought had been wanted, and had been obtained from the vague one which presented itself. Now, this end to be realized must be stated, then chosen, and finally attained. That is, it must be made clear whether the thought is going; and the goal of thought must also be one chosen from among many—the better the choice of goal, the higher the thought, though this choice is determined less by intelligence than by emotional, sentimental and instinctive life. But the adjustment of means to ends, which is adaptation, is the work of the intelligence.

This element is not new in Binet's psychology either; but the

experiments with imbeciles allowed him to elaborate on the phenomena connected with it. In experiments on associations, descriptions of pictures, definitions, it appeared that what is lacking in the imbecile is a critical sense. He will answer anything at all. Binet calls this "*n'importequisme*." But in addition to carelessness, this readiness to answer so requires "a thought which does not evolve, and one which does not pullulate." And evolution of thought and pullulation of ideas are the essentials of adaptation. The thought of the imbecile shows lack of differentiation (or of adaptation) when he describes two totally different pictures by saying for each, "There, there are men." He cannot make his definitions more precise than, "A fork, it is to eat with." Ideas do not occur to the imbecile, and moreover, he does not refine those he does have, bring them to a goal.

The last part of Binet's scheme is the *esprit critique*. By this he means self-criticism, of the kind to be found so often in Shakespeare's soliloquies. The choice of ideas which takes place in adaptation presupposes some kind of criticism, and this is what Binet has here in mind. The censorship, the elimination of unsuitable ideas, does not have to be done consciously, because there is a kind of secret systematization which prevents them from even putting in an appearance.

The feeble-minded shows a lack of censorship at every point: in his uncontrolled behavior, in his *n'importequisme*, in his meeting the request to make an *a* by making a meaningless scribble, and then grinning with a satisfied air, although he can see that his scribble does not resemble an *a*.

It is obvious that these three parts of Binet's scheme cannot be separated out except artificially, for they all work together and are part of a single process. Both direction and censorship are involved in adaptation. The description which has resulted from these investigations (and also from the influence of William James) is of a functional, as opposed to a structural kind. And Binet prophesies that the result of this shift in emphasis from structuralism to functionalism will be that instead of measuring the intensity of the phenomena of consciousness, psychologists will measure the useful effects of acts of adaptation, and the

worth of the difficulties conquered by them. Somehow they will succeed in making a hierarchy of the acts of individuals judged according to their abilities.

This schema of thought, included in an article on the intelligence of the feeble-minded, really amounts to nothing but a scheme of normal intelligence based on observations among the feeble-minded. The same outline, condensed and with slight variations, appeared during the same year in *Les idées modernes sur les enfants*. It is given here, for the reader to have it in Binet's own words, and also to allow a comparison between the two versions:

"I have recently proposed, with Dr. Simon, a synthetic theory of the functioning of the mind, which . . . will show clearly that the mind is one, despite the multiplicity of its faculties; that it has one essential function to which the others are subordinated. And one will understand better, after having seen this theory, what conditions the tests must fulfill in order to include all intelligence.

"In our opinion, intelligence, considered independently of phenomena of sensibility, emotion, and will, is above all a faculty of knowing, which is directed toward the external world, and which labors to reconstruct it as a whole, by means of the small fragments of it which are given to us. What we perceive of it is element *a*, and all the very complicated work of our intelligence consists in uniting with this first element a second element, the element *b*. All knowing (*connaissance*) is thus essentially an addition, a continuation, a synthesis, whether the addition takes place automatically as in external perception . . . or after a conscious search. . . . But note well that in this addition to the element *a* there is already a host of faculties at work: comprehension, memory, imagination, judgment, and above all, speech. Let us retain only the most essential, and, since all this culminates in the invention of an element *b*, let us call the operation an *invention*, which is executed after a *comprehension*. The operation cannot be performed without our knowing what the question is, without our adopting a certain line, from which we do not deviate; thus a *direction* is necessary . . . the ideas must be judged as fast as they are produced and rejected if they do not fit the end pursued; there must, thus, be a *censorship*. Comprehension, invention, direction, and censorship, intelligence is contained in these four words." (Binet, *Les idées modernes sur les enfants*, Paris, 1909, pp. 117-118.)

The discussion in the article on imbeciles is, of course, much more profound and thorough. Here the matter is simplified by calling the result of the operation an invention, whereas in *L'Année* the invention is subordinated to the evolution of thought from the general to the specific. The exposition in the book is simplified for the lay population; it is inferior to the other.

The terms adaptation, direction, censorship, do not stand for

"faculties," or for particular acts. They are dynamic terms, describing different aspects of what is happening when the intelligence (which is apparently no longer synonymous with consciousness) is at work. Attention, memory, reasoning, comprehension, work together in a way which shows direction, censorship, adaptation; but how the direction takes place, for instance, is not even asked. It is simply an observed fact that it does. And according as there is more direction, censorship, adaptation, the individual is more intelligent; if the individual is deficient in these, he is feeble-minded. Thus Binet succeeds in defining feeble-mindedness in general terms of the modes of functioning rather than in specific terms of "fleeting attention" or the like.

He immediately proceeded, however, on a course which would allow him still further to deepen his concept of intelligence, and to define the meaning of these words. In 1910, in a preface to the *L'Année* for that year, he announced his intentions, not only of continuing his studies of child psychology, but also of formulating a "synthetic psychology," one which should "show the machine in action." It was Binet's interest in the practical that led him to study the child's aptitudes, and his nevertheless undiminished interest in pure theory that led him to formulate a system.

"I hope in 1912 to be able to publish in *L'Année* a study already begun a long time ago on the different aptitudes of children; it will be the logical complement of the measurement of intelligence. I think the knowledge of aptitudes is the finest problem of pedagogy. It has as yet been treated nowhere . . . and at the moment we possess no sure procedure for investigating the aptitudes of any subject, child or adult. . . . There would be immense profit in knowing the worth of each one and the vocation for which his nature destined him; methods and tests which would throw light on vocations, aptitudes, and also inaptitudes, would render immeasurable service to all. As soon as the theoretical part of the problem was solved, practical applications would not delay, and a whole intelligent organization of placement would be made, I know. . . . But the theoretical work to be done is immense. I undertake it right now with a veritable army of tried collaborators.

"I have likewise in preparation . . . an essay on synthetic psychology. . . . The works which appear in psychology are especially analyses; these analyses no more allow one to form an idea of psychology as a mechanism than the crumbling of a statue allows one to form an idea of the intact statue. What one seeks to see, and what one by no means does see, in current treatises, is the ensemble, the synthesis; that is to say, the manner in which the machine works. I think it would be important to seek to understand how the different pieces of the machine exert their reciprocal action; that is what one can call

synthetic psychology." (Binet, "Le bilan de la psychologie en 1910." *A.P.*, 1911, 17, x, xi.)

Binet died before publishing either his work on aptitudes or his essay on psychology. His knowledge of aptitudes would most probably not have been incorporated entirely into the essay, but it would have contributed to it as the knowledge of the abilities of the feeble-minded contributed to the scheme of thought. By continuing to outline Binet's most important publications after 1909, it is possible to find indications of what the essay on psychology would have contained.

After formulating the scheme of thought on the basis of his work with the feeble-minded, Binet immediately proceeded to employ a similar method with the insane; here it is possible to discover still other facts about the functioning of normal intelligence, simply by discovering in what ways it can function incorrectly. Moreover, phenomena of normal intelligence often exist in the insane in exaggerated form, and are more easily observed in them. With the double intention of introducing some badly needed order into the field of abnormal psychology, and of continuing his study of the nature of intelligence, Binet went to work with Simon to draw up a classification of the insanities.

The aim of the classification was to give such a description of each type of abnormality that it would not easily be confused with any other type. Patients suffering from each type were carefully observed, and most often subjected to some experimentation in which the tests from the scale were frequently used. The characteristic mental state accompanying each type was described in the same functional manner as had been the scheme of thought. And following each study of an insanity come "Remarks for psychology."

General paralysis and senile dementia were described before the rest of the classification was begun. (Binet and Simon, "Nouvelle théorie psychologique et clinique de la démence," *A.P.*, 1909, 15, 168-299.) The scale was applied to both the paretic and the senile, and showed that in each there is a lowering of the level of intelligence. When the responses were analyzed, however, they showed differences from those of the feeble-

minded, for they retain residues of a mentality that was once higher. These residues take the form of a more complicated syntax than the feeble-minded could ever master, or words which he would never use.

There are peculiarities which easily distinguish between the two dementias. In general paralysis one finds: failure and slowness in the recall of certain memories; errors in recalling colors; difficulty in the flow of words; *lapsus calami* (negligence, omission of part of a word or sentence); arithmetical errors; disorder; incomplete perception; illusion; inertia of comprehension; incongruous replies (grafting irrelevancies on to a reply). But back of almost all of these disorders is a single common cause: a lack of evocation of ideas (that is, a failure of an essential part of adaptation). It is not, for instance, that the paretic *cannot* count backward from 20 to 0, but that the request does not strike home and suggest the progression: 20, 19, 18, etc. By dint of emphatic repetition, Binet at length persuaded a general paralytic to count backward perfectly. Memorial difficulties obviously arise from this failure of ideas to appear. Comprehension, too, depends on this; if ideas do not emerge from which one may choose those which throw light on the question, it is simply not possible to comprehend. If no ideas appear, one might as well be hearing words in a foreign language. This is the difficulty of the general paralytic, as proved by his initial lack of comprehension and the possibility of ultimately evoking in him the necessary ideas. The disorder is simply a functional inertia which interferes with the psychological processes. The same phenomenon manifests itself in normal persons under the influence of ill-humor or chagrin as well as in the process of material decay, by an impossibility of solving the more complicated problems while the simpler ones remain attainable. The inertia for the complicated does not make impossible a superactivity for the simple. The troubles of the general paralytic show the disorders which follow upon the failure of the evocation of ideas.

Senility, on the other hand, does not have as characteristic anything as central as functional inertia. The minor psychological characteristics of general paralysis listed above do not

apply to senility, which consists primarily of a loss of memory. Comprehension and judgment are not affected by any deficiency of ideas, and the senile person does not make absurd statements. The senile dement is also conscious, as the paretic is not, of the decay that is going on in him. The ability of the senile person to judge gives the impression of a personality that is not disorganized or amorphous, but which holds together.

Now, the scheme of thought, which showed that the affection of the feeble-minded is something general and a matter of degree, refuted the theory that the "faculties" may be altogether distinct even in their location in the brain. The picture of the senile dement bears out further the opposite notion, that the intellectual processes and the emotions are not entirely unrelated but may even work together. Judgment may take place in the senile as well as in the normal, although he lacks some of the intellectual equipment necessary for it; he does not have all the images which, according to an intellectualist theory, should accompany judgment. Yet he can judge, because the process of judgment is fundamentally one of feeling rather than of reasoning. A studied judgment, based on evaluations, and comparisons with norms, is indeed reasoned: but the more usual, impetuous judgment, as when one exclaims "But that is crazy!" is based on feeling. The process is described as follows:

"Judging consists essentially in an emotive and motor tendency to approve and to disapprove; this tendency may indeed manifest itself by ideas which are the motifs of judgment; but often the ideas do not form themselves clearly after the judgment is pronounced, and often they are so slow in forming themselves that they never appear; one judges without motif, without justification; without ideas, but nevertheless, one judges. At the moment of judging one is animated by a certain feeling which is the foundation of the matter . . . one may have the feeling that an action is impossible, or that a certain course is unreasonable . . . and one disapproves because he is animated by a certain feeling of disapprobation without having a single clear idea, without attempting to give any justification." (Binet and Simon, "Nouvelle théorie psychologique et clinique de la démence." *A. P.*, 1909, 15, 168-272. This passage is taken from Miss Kite's translation of that article in *The Intelligence of the Feeble-Minded*, p. 311.)

The feeling here involved seems to form a connecting link between emotion and judgment, which is an intellectual act. Feeling also accounts for recognition, which is ordinarily explained by an act of ideation and comparison: e.g., a subject

can recognize whether a word belongs in a certain list of words, in less time than it would take to remember the whole list, although that act would be necessary according to the classical theory. Feeling enters into thought, also, as a feeling of intention (what Binet elsewhere calls direction). This theory, that the intellectual processes are united with the "lower" ones makes it possible to explain why patients who have lost their memories nevertheless continue to be capable of judging. The most delicate parts of a complex process have been destroyed, but the ruder, and more fundamental stages remain.

"According to our hypothesis the feeling presents itself in a definite relation to the idea. Idea and feeling make one; they are two successive stages of the same process; that which is idea was at first a feeling and the feeling in evolving and rendering itself precise becomes at the same time idea, word, action; the feeling is the obscure, heated stage; when it clears it becomes more comprehensible and rational, it produces ideas. In senile dementia it is the last part . . . the idea that is struck and withers; but the instinctive part remains vivid; and it is thus that senile dementes are reduced to an instinctive existence consequently very low, very animal, but still coördinate. . . . It now appears to us that it is not only the control which can occur under the form of feeling, but also the direction, since senile dementes in spite of their amnesia know how to keep a given direction and a prolonged attitude." (Binet and Simon, *op. cit.*, p. 314.)

The meaning of the terms "censorship" (control) and "direction," and probably of "adaptation" too, begins to be filled out with "feeling." That is, it is feeling which somehow operates to produce direction and the rest. Exactly what feeling is, is not stated; but at least one knows that it is an observed psychological phenomenon, which is somehow related to emotion. It is considerably more than a mere descriptive word. Now it was necessary to clarify the meaning of "feeling" and to find out how it operates in the mental life.

The full classification of the insanities appeared in the sixteenth volume of *L'Année*, 1910; this too was prepared with the collaboration of Simon. Each of the six classes covered is accorded a historical treatment, and a criticism of the theories previously offered, before the new description is given. This description is always given in two parts: first, the symptoms peculiar to this abnormality (and not found in others); secondly, the reaction of the rest of the personality upon these symptoms. This description is labeled "*état mental*," or mental state; but it

is never given as something static, as the term 'state' leads one to expect. The symptom is always an abnormal way of functioning; and the reaction of the rest of the personality denotes the way in which the personality of the patient functions as a whole. After this description follow remarks for psychology, usually on the nature of emotion, feeling, or attitude, from which would have come the pillars of Binet's system, had he completed it.

The first class of abnormality is hysteria; there is little said about it not already to be found in *Les altérations de la personnalité*. The symptoms in the mental state are those resulting from a special degree of suggestibility; the suggested idea is realized, and becomes a sensation or a hallucination. The mental state which receives (reacts on) the symptoms is composed especially of unconsciousness. What seems to have been lost (*e.g.*, sensation) has become unconscious. The unconscious in the hysterical is, or can be, living. The living unconscious differs from a dead one in that it can be evoked again but in a different state (somnambulism) called a different level of consciousness. There is a separation of consciousnesses.

The facts of unconsciousness form the main outcome for psychology. Thinking is aided over periods of time by unconsciousness. But what the unconscious furnishes is not precise facts, but rather a direction:

"a matrix-idea containing many germs which must afterward be developed by reflection." (Binet and Simon, "L'Hystérie." *A.P.*, 1910, 16, p. 121.)

The unconsciousness found in hysteria bears so much resemblance to that found in ordinary psychic phenomena that some authors, including Janet, concluded that there are limits to our consciousness, but that these limits are only relative, and what is unconscious for us is nevertheless not necessarily unconscious *in* one's self.

The definition of hysteria follows:

"There exists in hysteria a state of separation of consciousness by which the subject remains a stranger from the point of view of perception, memory, judgment, and will to the phenomena which take place in him by reason of his extreme suggestibility and which end in complete realization." (Binet and Simon, *loc. cit.*, p. 122.)

The second abnormality is "Folie avec conscience," or lucid insanity. The mental state is characterized by a fear, an obsession, or an impediment to the functioning of the intelligence. Such fears may be found in dementia praecox, but the attitude of the rest of the mind differs in the two cases. In lucid insanity there is consciousness of the morbid trouble and an exact judgment of its nature, with a desire and attempt to fight it. Often, but not always, there is a final feeling of impotence in this fight. The intellectual level is not lowered. There is no loss of unity as in hysteria, or degeneration, as in dementia. As in hysteria, there is influence exerted from outside, but the suggested idea is not itself materialized; it becomes a kernel, is built upon and elaborated. For instance, suggestion may give the idea for a phobia.

Whereas in senile dementia the analysis led to a differentiation between instinctive and ideational intelligence, the former being characterized by the absence of an exact image picturing the end to be attained and the means to be employed, in lucid insanity the analysis leads to theorizing on the intellectual feelings which are connected with instinctive intelligence. In senility the disorder occurs in the higher, and in lucid insanity the disorder occurs in the lower part of the mechanism. The intellectual feelings of confidence, of completion, of normality which are so natural that ordinarily we hardly notice them, are completely upset in lucid insanity. There it is all lack of confidence, anxiety, strangeness; it is the stamping ground for the pathology of the intellectual feelings.

Lucid insanity throws light, also, on the two antagonistic principles which Taine had proposed: one that affirms, and another that corrects. The principle of correction, of course, is related to Binet's "censorship."

"Our self-control consists of several different actions . . . an act of prevention, an act of censorship, an act of opposition, and finally an act of suspension.

"The preventive act . . . consists in preventing certain acts, certain ideas, certain feelings from being produced, even before they present themselves to the thought. . . ." (Binet and Simon, "La folie avec conscience." *A.P.*, 1910, 16, p. 159.)

It is here, in the power of control, that the trouble of the person with lucid insanity is centered. The act of censorship is a tribunal, but in the case of lucid insanity, the orders of the tribunal are not carried out. This shows that to judge and to act are two different things; these patients are capable of judging, but cannot act accordingly.

"What is morbid in the individual suffering from lucid insanity is thus not his power of control taken generally, as a single function. His consciousness of the troubles, the censorship which he exerts over them, the moral pain which he feels from them are only means of defense employed by an organism that wishes to safeguard its integrity. It defaults only in the power of repressing the development of its morbid states, either in a preventive or in a suspensive way." (Binet and Simon, *loc. cit.*, p. 162.)

The patient in lucid insanity opposes his trouble, but unsuccessfully. This indicates that in his self-control there must be two parts: the agents that perceive, judge, and desire, which are conserved; and the events which bring about either preventively or after the event a suspension; these are touched, weakened, or destroyed.

The definition of lucid insanity is:

"In lucid insanity there exists a mental state of conflict by which the subject preserves the consciousness and judgment, but loses will with respect to the troubles which are produced in his mental functioning." (Binet and Simon, *loc. cit.*, p. 163.)

The third insanity is the manic-depressive, which it is ordinarily difficult to distinguish from other insanities, because they also include states of agitation or depression. The symptoms which Kraepelin listed for manic-depressive insanity are found also in dementia praecox.

The symptoms of the mental state, as Binet and Simon describe them are, a lowering of the intellectual level without its destruction, and excitation or depression. The acts of these patients manifest an internal state which is usually a fundamental state of excitation colored by different nuances of emotions, according to the case.

The manics are very active in speech and actions; they write long and countless emotional letters. A slight cause may change their emotion from one extreme to another. Although they seem so active, the quality of their activity is low: *e.g.*, associations

may be made by simple similarity of sound. They are incapable of performing a continuous task. The affective and motor levels are both lowered.

The melancholic cannot be directly opposed to the manic, for some of the symptoms are the same. The intellectual level is here also lowered for the time; sometimes there is an incoherence evident, the patient jumps from one idea to another. Generally his delirium is not very intelligent, varied, or deductive. He may be content with the first interpretation that comes, or his interpretations may be simply associations of sad ideas.

It is the apathic that may be truly opposed to the manic. Whereas the manic is altogether excited, the apathic does not feel at all. Intellectual, affective, and motor activities all fall below normal. The patient is mummy-like. And it is not anything like pain that prevents his activity, but an inertia.

As for the attitude of the rest of the personality toward these accidents, the personality of the patient is simply lost. He is reduced to his morbid accidents. He is all words and gestures if a manic, and all complaints if a depressive. The powers of perception, of direction and of control seem to be suppressed, or at least suspended, inhibited. The word *domination* is used to express this suspensive action, this psychic paralysis. The patients are dominated by the general phenomena which impose themselves on them, against which they are unable to fight, and which hinder the actions of the mechanisms of thought, though they leave them intact. For the intellect, though temporarily lowered in manic-depressive, is seen in moments of relative calm to remain about the same as before. Although the patient is incapable of sustained effort and is incoherent, this is rather superficial; his faculties have not been destroyed. These patients will sometimes make strikingly intelligent remarks; they may, if caught at the proper moment, answer correctly to one of the more difficult tests of the scale; and they may show greater coherence if asked to write a letter. This preservation of the intellectual level despite the apparent lowering is important in the diagnosis of manic-depressive insanity.

What the manic and depressive have lost is *judgment* and

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*direction.* Direction is what causes us to undertake a task and carry it to completion; but these patients proceed by chance associations of ideas alone. And as this awakens only relations of resemblance and contiguity between ideas, it cannot lead to any but incoherent products. Even in delirium there is more order than in this chance association; in delirium (delusion) there is a theme, a direction. In chance association there is none, there is no voluntary attention. Therefore

" . . . It is the suspension of the faculties of direction, criticism, and suspension which, coinciding with a production of elementary phenomena, the expressions of emotions or apathy, constitute the common element of these three states." (Binet and Simon, "La folie manique dépressive." *A.P.*, 1910, 16, p. 208.)

Manic-depressive insanity resembles lucid insanity in being intermittent, and involving agitation and anxiety. The difference is in the lucidity of the one, and his conflict. Both feel themselves under compulsion; but one fights it and the other does not.

This insanity, in which the patient is at the mercy of a latent emotion which awaits only the slightest excuse for taking shape, naturally leads to reflections on the psychological nature of emotions. They show that the life of the emotions is rather paroxysmal, and that there is an independence between the quality of emotion and the state of excitation or depression—for the depressive may show signs of excitation. Excitation and emotion are actually different, for the first may exist without the second.

James' theory of emotions, which supposes that they are a knowledge of bodily sensations, is rejected; knowing sensations is an intellectual act, not an emotion. A more dynamic theory of the emotions is offered to replace James'. According to this theory, there must exist, before the emotion, a state of excitation in the body; when this excitation is discharged, it takes the form of one emotion or another.

" We believe it preferable to maintain that every emotion supposes a discharge, either in the domain of ideas or in the domain of actions. This discharge is the primordial element, the basis of the situation. It is this which we shall designate under the name of excitation. It is accompanied by varied states of the body, such as an increase in the pulse. . . . It is these states which, according to James' theory are perceived by the subject; and the perception of them constitutes an emotion. But these perceptions are only the

evidence of a phenomenon of discharge; they do not constitute it. They only make us conscious of it. And according as it is this internal organ which is modified or that other, according to the very character of the modification perceived, we are conscious of a certain emotion, or of another. The emotion is thus secondary to the discharge; it is the conscious grasping of it by the intelligence; and besides, it contributes to the establishing of a large number of varieties of discharge." (Binet and Simon, *loc. cit.*, p. 213.)

Emotions are demoted to being secondary; they come after the phenomena of excitation and discharge. This implies, for instance, that they cannot be motive forces.

Manic-depressive insanity is defined thus:

"In manic-depressive insanity there exists a mental state of domination by which the subject preserves consciousness, but presents a suspension of judgment and of will with respect to the accidents which consist in an external manifestation of states of excitation or apathy." (Binet and Simon, *loc. cit.*, p. 214.)

Fourth comes "systematized insanity," insanity consisting primarily of delusions. The symptoms are hallucinations and delusional conceptions—which are, however, also to be found in hysterical or alcoholic delirium. The principal characteristic in the present instance is that the delusion represents an effort; there is research and elaboration on a nuclear idea. The patients do not detach themselves from the external world. They are good observers; it is their interpretation of events that is at fault. Their trouble is progressive; the delusion evolves logically in time.

The patient remains able to take care of himself and of his affairs; only his delusion tempts him sometimes to commit dangerous acts. His state resembles that of lucid insanity: his intelligence "holds together," his character remains normal. But the reaction of the rest of his personality upon his morbid trouble is different. There is a lack of censorship, there is no recognition that the delusion is something abnormal. The arguments they give are not purely rational, but contain a great deal of emotion. There is a *deviation* (from the normal) in the way the parts of intelligence coördinate in this insanity:

"It is to express this absence of censorship in the bosom of an intelligence which continues to coördinate and to construct that we have adopted the term *deviation*; we understand by that that the intellectual products do not cease to be both good and complex, if one looks at them in themselves, but they are made from a false point of departure. . . . In short, the patient gives in to an organization that is not at all in harmony with the external facts, with the

truths which are accessible to him, with the totality of his life and with the life of others; and he does not perceive the discord." (Binet and Simon, "La folie systematisée." *A.P.*, 1910, 16, p. 231.)

The two principal elements in systematized insanity are the systematization of the delusion and the preservation of the intellectual level. There is a particular, persistent orientation of the intellectual forces. The beliefs of these individuals have, as in everyone, an emotional basis, but it is because the passional element in them has taken a morbid turn that the patient reasons so poorly. These individuals have an emotional bias of the same sort as the pragmatist who believes things because he finds them useful to believe in; only in the insane person this bias is more serious. His emotional state suggests, maintains, imposes interpretations of events which accord with it. If the patient has a fear of a conspiracy against him, every chance event in the street is somehow related to this conspiracy.

The emotion at the basis of the delusion is something constructive, and it acts as an organizing force. The emotion of the manic-depressive is a mood which can be discharged in simple manifestations. In systematized insanity the emotion is a passion which incites to intellectual research; it places a problem before intelligence, and intelligence must solve it. And whereas the maniac will hit through need of hitting, the victim of systematized insanity hits through hatred, a desire for vengeance; his emotion has driven him to a particular, not a general act.

These passional emotions are constitutional; they form part of the person's character, and to that extent are hereditary; the cause of the affection is therefore truly distant, and also permanent. On the other hand, circumstances must allow occasions for them to show themselves.

Emotions have fundamental importance in mental life, for they allow the appearance of images and ideas which are in harmony with them; and for a new type of image or idea to be allowed to appear, there must first occur in the individual a corresponding change in the affective disposition. Emotions are attitudes, and it is they which determine our activities, rather than pleasure or pain.

"It is more exact to conceive of the basis of mental life as tendencies to act, and to enter into possession of certain things. These tendencies, when they are hindered, become desire; executed, they are accompanied by pleasure or pain. In the moments of waiting, the action is suspended, the tendency is reduced to an attitude, that is to say a motor disposition which corresponds to the beginning of an action. These attitudes, with the sensations and emotions which accompany them, are numerous in every-day life, and they form so large a part of the phenomena of consciousness that one might go so far as to say that our whole psychology is composed of representations and attitudes. Attention is an attitude, will is an attitude; it has been said that generalization is one too, that is to say a disposition to act in the same way in cases which are judged to be identical; that judgment itself is an attitude, that is to say, a disposition to execute actions which consist, according to the case, in acquiescing or refusing, affirming or denying. In addition to all these attitudes which constitute what one ordinarily calls intellectual acts, there exist other attitudes which one can call, and which have in fact been called emotional. They are constituted by the expressive and somatic part of the emotions. Love is not only a tendency to embrace, but a sketch of the actions which lead to it, an amorous attitude reduced to an outline. It is something analogous which must figure in the basis of the mind of those very emotional individuals who we say suffer from systematized insanity. Their mind is occupied by passional attitudes of grandeur or suspicion, pride or hate; and it is this internal attitude which they actualize and which they experience so strongly, and which inspires all the ideas of which their delusional conception is formed. (Binet and Simon, *loc. cit.*, p. 262.)

In this passage is the first hint that emotions are attitudes, and that attitudes are at the basis of our mental life.

Normal persons are also guided and to some extent ruled by their emotions, but in systematized insanity there is a deficiency of censorship exerted over the emotion and the ideas to which it gives rise. The censorship here invoked is not one which examines ideas, compares them to an ideal, and rejects or accepts them accordingly. Like the judgment discussed under senility, this censorship is a feeling rather than an intellectual act. Now, normally, if one has an emotion, which allows strange notions to appear, the censorship gradually changes the situation; there comes a new affective disposition which wipes out the preceding one, and upsets this beginning of a delusion. This is equivalent to saying that one attitude—for censorship is a feeling, which has just been described as an attitude—gradually supersedes another.

So the meaning of adaptation, direction, and censorship is filled out still more. They are attitudes.

The definition of systematized insanity is:

"Systematized insanity is a mental state of deviation in which the subject retains his consciousness but suffers a perversion of judgment and will with

respect to the passionate direction of his reasonings." (Binet and Simon, *loc. cit.*, p. 265.)

The discussion of the dementias comes next. The dement is characterized by a disorganized personality and by an actual lowering of the intellectual level, a true decay which is not found in the insanities. It is through this decay that the two may be distinguished. The evaluation of the mental level presents, of course, dismaying difficulties, especially in such instances as those in which a delirious condition makes it impossible to approach the patients with the tests of the scale. Moreover, the level may be temporarily lowered in a manic-depressive, and until he happens to have a more lucid moment, it is impossible to say whether the lowering is permanent or not. When the dement has delusions, however, they usually express his mental level, which is low. Other insanities show delusions of a higher order.

The different dementias, though all characterized by this lowering of level, have their specific marks which distinguish them from one another. In general paralysis, as has already been pointed out, there is a halt (literally, a 'hitch') in the functioning. The paretic's troubles are inconstant: he will answer one question correctly and fail the next, though it is just like the first. In senile dementia the weakening is not global, but systematic. It affects certain processes and spares others. The instinctive part of the intelligence is spared, but the ideational intelligence is obscured.

Dementia praecox has generally proved the most troublesome of the insanities for the clinician. It resembles hysteria, lucid insanity, manic-depressive insanity. But, says Binet, the difference is that in praecox the intellectual faculties fail, whereas in the insanities which it resembles they do not. (The only difficulty for the clinician, then, would be to determine whether the intellectual faculties have, in the light of the scale, been damaged. A mere nothing!) He rejects the notion that the praecox lacks emotivity, first because he finds that they do not lack it, and secondly because this deficiency would be insufficient to account for their poor reasoning. In the last analysis, praecox must be determined by first making sure that the intellectual faculties

have been damaged, and then by differentiating it from general paralysis and senility. For there is no symptom that one can give for *praecox* that cannot be found in some other insanity as well.

The definitions follow:

"General paralysis is a dementia in which the destruction of the intelligence manifests itself especially by halts (*accrocs*) of functioning."

"In senile dementia the lowering is less pronounced for the instinctive life, and notably judgment, than for the intellectual life, and notably memory."

"Dementia *praecox* is a dementia which on the one hand does not present the characteristics of the two preceding, and of which, on the other hand, the clinical picture borrows its peculiarities from the manic, or paranoid, or lucid insanity manifestations, which are added to a demential foundation." (Binet and Simon, "La *démence*." *A.P.*, 1910, 16, p. 348.)

The contributions of dementia to psychology have already been recounted.

Sixth and last comes feeble-mindedness. The feeble-minded are distinguished by their low intellectual level, which is not something acquired; it is a level beyond which they have been unable to rise. All processes seem to be present in them, but most of them remain undeveloped. The feeble-minded have also a differentiated type of intelligence; it is oriented especially in sensory and motor directions and fails at abstraction and generalization. The distinction cannot serve as a line between the retarded and the normal, however, as there are many normal individuals with sensory intelligence who cannot think abstractly.

The definitions of feeble-mindedness have already been given above. Binet compared the achievements of the retarded with that of the normal by finding the age of the average child up to whose level the retarded one came. He also found a standard for the normal by using his scale with about a hundred peasants and shopfolk, and found that their average attainment was twelve years. This he took as a tentative norm for the general population, and for the determination of feeble-mindedness.

The feeble-minded must be distinguished from the dement, who is in a process of decay, while the feeble-minded is standing still. Moreover, the dement usually shows a clouding of the consciousness with somnolence and sometimes stupor; incoherence of ideas; sometimes even phenomena of excitation. These

are probably lacking in the feeble-minded. The feeble-minded is also much like a child in character and way of thinking, but lacks the child's grace, and exuberant activity.

This classification of 1910 was supplemented in 1911 by another type, "mental confusion." (Binet and Simon, "La confusion mentale," *A.P.*, 1911, 17, 278-300). In this disorder the patient suffers from *obscurity* (as opposed to difficulty) of comprehension. His ideas are confused and incoherent. If this confusion is temporary, occurring under the stress of an emotion, it is probably curable. An incoherent thought is here defined as one which is developed without an end, whereas a coördinated thought is one in which the elements tend toward an end. This is in accord with all else Binet has said about thought.

In volume seventeen appeared also a definition of alienation in which the method employed is to define it from the medical and sociological point of view as well as from the psychological. Psychologically insanity consists on the one hand of a lowering of the normal level of intelligence and feeling; and on the other of a state of disequilibrium. The disequilibrium consists of an active element: a growth which is strong and exaggerated (*e.g.*, an obsession); and a weakness of the higher processes of direction, choice, criticism, volition, suspension, which in the normal individual continually control the products of the active functions. There is a deformation, whether by excess, deficiency, or deviation, of a psychological function, and the rest of intelligence makes a morbid reception to the products of this deformed function. That is, these products are not criticized, or rejected, or organized. The higher controlling processes, which ordinarily bring into line whatever might be irregular about our mental life fail to do so in the case of the insane. Binet and Simon, "Définition de l'aliénation," *A.P.*, 1911, 17, 301-350.)

In conclusion, this study of alienation was not intended to furnish precise ideas on the constitution of mental diseases; it deliberately ignored other factors such as etiology, treatment, evolution. It is possible that the same mental state may be found in two different diseases, although the pathogenic element is different. But the purpose of the study was simply to make it

possible to make a differential diagnosis between two known mental diseases. The method used has the advantage of allowing one to penetrate more deeply into the phenomena of insanity. The terms separation, conflict, domination, disorganization, arrest of development, which emerge as descriptions of the different mental diseases by the use of this method are considered by Binet to be much more clear and precise than the ones previously used: mental synthesis, hypertrophy, disassembling, perversion, disequilibrium, etc. The descriptions of both symptoms and the reaction of the rest of the personality are really a complete description of a mental disease.

Finally, the authors relate their results with alienation to their theory of thought (intelligence) :

"What gives still more generality to this outline is that in our opinion it is the one which best explains normal activity. We have said elsewhere that all mental operations suppose on the one hand a production, that is to say an ensemble of phenomena formed of perception, of comprehension, of logical invention, of imaginative invention; and on the other hand a direction and a control. It would be easy to show that this production represents especially automatism, and that this control represents especially the reflective part of our being. It would be easy to show also that the aim of education is to favor the establishment of this hierarchy between automatism and the higher centers, for it is when this hierarchy is established that one truly possesses self-control. It is also when this self-control is lost or seriously compromised that one has become an alienated individual." (Binet and Simon, "Conclusions." *A.P.*, 1910, 16, p. 368.)

On the one hand Binet was led to discard the opposition of intellect and emotion as higher and lower functions because feeling is involved in intellectual acts. On the other hand, he suggests a new opposition, between production (of ideas) and criticism; production is automatic and criticism is intellectual. But it is not pretended that this dualism is absolutely rigid; one cannot really oppose the higher to the lower functions. There is a gradual shading of one into the other.

". . . it would be misunderstanding the suppleness of mental things to apply to them a rigid theory of cerebral localizations and to want to concentrate, for example, automatism and reflective life in distinct nerve centers. We do not give in to that illusion." (Binet and Simon, *loc. cit.*, p. 369.)

In drawing up this classification Binet used the methods and tools which till then he had succeeded in perfecting. The very approach is in a sense that of the psychology of individual differ-

ences, for these descriptions are really psychological types, and the different ways in which their minds work. Then, the standardized tests of the scale served, both in evaluating mental level, which is a question of importance in the psychology of the abnormal, and in experimentation which had other ends in view. And the interpretation of results throughout is based on the elements of the scheme of thought; the abnormality is due to some malfunctioning of adaptation, direction, censorship. And at the same time, the ground is being prepared for improving on the scheme of thought, and for a synthetic psychology. The descriptions of the insanities are themselves synthetic, showing as they do the relationships existing between different parts of the personalities.

The quotations which have been taken from this treatise indicate the elaborations which were to be made on the scheme of thought, which would have formed the core of the synthetic psychology. They show that in the new system, the unconscious would assume a rôle in the psychology of normal persons (see section on hysteria). Probably a majority of psychic phenomena would be reduced to attitudes, for that is done here (see page 103 above); it is said that "our whole psychology is composed of representations and attitudes." Judgment is described as a feeling, which is in turn an attitude. Censorship is also an attitude; it is related to emotion, for it is said that emotions allow images and ideas to appear which are in harmony with them, and this is what censorship essentially does. But emotions themselves must be subjected to censorship; it is the failure of this censorship which leads to systematized insanity. Direction is also linked by Binet to attitudes, through emotions, for in connection with systematized insanity he says that emotions act as an organizing force, they give the direction. And emotions, he says, are attitudes.

A theory of emotions is expounded which is more dynamic than that which emerges from the functional psychology of William James. Emotions are the form in which a state of inward excitation discharges itself. The sensations are the accompaniment of this discharge. Now, when emotions are made thus secondary,

and are not considered as a class of phenomena totally divorced from others, it is easier to understand how they can be related to motor acts on the one hand and to intellectual acts on the other.

The importance of organization is tacitly assumed throughout the treatise. An important difference, for instance, between the senile dement and the paretic is that the personality of the latter is more disorganized. The descriptions, too, are in part descriptions of the way in which these personalities are organized. In the case of the feeble-minded it is said that there has been an arrest of organization. Lack of organization is characteristic of the dementias.

The definition of alienation is a first intimation of how these elements work together, the critical processes, which we have seen to be attitudes, controlling the rest of the mechanism, which is in large part also attitudes.

Binet did get so far in preparing for his essay on synthetic psychology as an article entitled, "Qu'est-ce qu'une émotion? Qu'est-ce qu'un acte intellectuel?" (*A.P.*, 1911, 17, pp. 1-47), in which he systematically related emotions and intellectual acts to attitudes and to each other.

This article, which was published a year before the reaction against associationism produced John Broadus Watson's behaviorism at one extreme and *Gestalt* psychology at the other, is introduced by a section entitled, "The crisis in psychology." The crisis which he heralds is due to the discovery of imageless thought and the consequent realization that the old classical psychology, which always assumed the intervention of sensations or images, could no longer be employed. It would be necessary to erect a system of psychology which would instead be in accord with the theory of imageless thought; and that, of course, is exactly what Binet had for years been preparing to do. Ever since he had discovered imageless thought in his experimentation he had slowly been evolving a theory of the working of the mind which was based on it.

The difficulty created by this discovery could not be disposed of by simply renaming things. It was necessary to go back to the general, to the nature of intellectual acts, the conditions,

effects, and elements of the act. So far the conditions and effects of intellectual acts had been known, but their nature had been left in obscurity. And the nature of intellectual acts being unknown, the psychologist had no conception of the mind as a unity, for he did not know whether there was any common element running through both intellectual acts and emotions.

Attitudes constitute this common element in Binet's system. By a mental attitude he means something analogous to a physical attitude: a preparation for the act, a sketch of the as yet potential action which is revealed by subjective sensations. Attitudes are motor; they bear the same relation to the movement that the image bears to the sensation: the relation of a weak state to a strong one. The question is now one of reducing emotions and intellectual acts to attitudes. This is done from the point of view of the mental composition of the attitude.

Affective phenomena can be divided into those which result from external stimulation, as, prodding causes pain, and those which are active responses, which involve action. According to the theory of evolution, indeed, the outward signs of emotions are the remains of what, once upon a time, used to be the beginnings of actions. The James theory of emotion shows the necessity for such a dynamic conception; the perception of organic sensations, which for James constitutes emotions, does not explain what makes us perform unconsidered acts, or multiplies our strength by ten, or determines our beliefs. These phenomena are understandable, however, if emotion is considered to be the beginning of action. The emotion exists as soon as there is an emotional attitude, but it does not become conscious until the attitude is perceived by the subject.

Justification for this theory is found in the fact that some insane women will deny, while giving such outward signs of emotion as weeping, that they feel any emotion. That is, the emotional attitude has been effected, but not perceived. (This interpretation of Binet's seems rash, for might it not be that in the insane there occurred an unnatural split between the signs of emotion and the emotion itself? The instance lends but tenuous support to the theory.)

Intellectual acts, theoretically at least, can also be reduced to attitudes. For when one explains an idea to a friend and he frowns, shrugs, smiles, goes through a whole series of varied expressions, these expressions must have their psychological counterparts; these are bodily accompaniments of judgments and reasonings of all sorts. Bain too held that thinking is restraining one's self from action, that belief is attested by a disposition to act in a certain manner. And it is simpler to reduce such relational elements as *and* or *but* to the remains of motor attitudes than to reduce them to sensations; according to Miss Washburn, *but* signifies a suspension of motor adaptation. It seems possible, therefore, to reduce intellectual acts to attitudes, although in this article it remains something purely hypothetical, and Binet could not then see any means of demonstrating it.

It is through the sensory accompaniment of the attitude that one distinguishes an emotional attitude from an intellectual one. If there are strong sensations, of an organic nature, if there is a decided bodily effect, then it is emotional. On the other hand, if there are very few of these subjective sensations, but there begin to be objective images, then it begins to pass from an emotional attitude to an intellectual one. To effect this change, it is necessary only to change the quantity of organic sensations accompanying the attitude. Thus it is that feeling, which is emotional, can nevertheless be very close to understanding, which is intellectual; the same attitude can in time be altered from the one to the other. Thus also the intellectual act may be said to be an emotion complicated by perceptions of relations, while the emotion is an intellectual act more directed toward action. But the difference is more than this, for in addition to being closer to action, the emotion implies special feelings, a clouding of consciousness, and a diffusion, a useless agitation. It is this clouding of consciousness which makes too intense emotion morbid.

All this discussion leads to a restatement of what an attitude is:

"An attitude is composed of a series of intelligently coöordinated acts with an end in view; but there are many ill-coöordinated acts, and there are even many diffuse reactions. In anguish, for example, one observes frequent and disturbed respiratory movements; this disorder of respiration can hardly be assimilated to an attitude . . . it is rather a motor discharge which spreads irregularly in a special direction. Now, it is precisely in the emotions that one observes

such discharges. It is thus advantageous to consider the attitude as a variety of motor response which distinguishes itself from others by the superior character of its organization. And one will say that the more this organization is realized, the more the attitude, all other things being equal, will be of an intellectual kind; the more feeble, on the contrary, the organization is, the more we shall have to do with a phenomenon of pure emotion." (Binet, *loc. cit.*, p. 36.)

It is now the degree of organization in an attitude which determines whether it is intellectual or emotional.

But how do these attitudes work? How, for instance, does an act of will take place? Through the conflict of two attitudes. When one attitude, with certain qualities accruing to it, replaces another, we recognize the change as an act of will; the new attitude must appear to have been chosen, and to be a good and useful attitude. Thus, will is not a cause, but is an attribute of certain processes.

The concept of attitude is helpful also in explaining the unconscious. Attitudes are themselves largely unconscious; that is what makes them so difficult to analyze. And since attitudes play so important a rôle, it follows that the unconscious too is immediately introduced "into the core of the mind" of the normal as well as of the hysterical person. Habit, too, becomes unconscious; what had originally demanded a great deal of effort and was accompanied by consciousness is eventually simplified and is performed with a minimum of effort and consciousness. What is left is the unconscious attitude. The unconscious is what is left when one has taken away all the conscious elements of an attitude; for of course as one takes away sensations from an attitude, the attitude remains but the conscious element disappears.

"The unconscious is a psycho-physiological process reduced to its physiological part, the attitude; or, to speak more exactly, the unconscious is the conservation and isolation of the motor part contained in every intellectual act; more briefly still, *the unconscious is a motor habit.*" (Binet, *loc. cit.*, p. 42.)

Even instinctive activities are explained, at the same time, by attitude. They are unconscious, and they are therefore to be explained as ancestral habits which an appropriate sensation will release.

This, Binet's last theoretical article, ends not only with the denunciation of the classical psychology, but also with a definite direction for the new psychology. It is action that should be

introduced into psychology; and he feels that his theory of attitudes does introduce the necessary action. His theory is a dynamic one. Once more he insists that it is not necessary to evoke images in order to understand, that the interpretation which is involved in comprehension must always go somewhat beyond any image which may be evoked. But according to his new theory understanding results from the realization of an indefinable attitude; this attitude corresponds to movements which would be appropriate to the word we understand, and we feel that the movements and the attitude are correct. This theory directly antagonizes the sensationalist theory; for here it is admitted that one can understand without realizing anything intellectually, merely by having the feeling of understanding; "one has the movement, the physiognomy, the attitude of understanding." (Binet, *loc. cit.*, p. 47.) The older theory supposes that

"... everything is coördinated; everything can be justified . . . it supposes, for example, that reasoning is composed of premises and conclusions, and that one deduces the conclusion from the premises. Against this theory stands the new one, a theory of action, according to which mental life is not at all a rational life, but a chaos of shadow crossed by flashes, something strange, and especially discontinuous, which appeared continuous and rational only because after the event it was described in a language which brings order and clarity everywhere; but it is a factitious order, a verbal illusion, which does not resemble reality any more than the rumbling of a classic tragedy resembles the unleashing of passions." (Binet, *loc. cit.*, p. 47.)

In this article, attitude becomes the key to the unity of the mind. All behaviors, motor, emotional, intellectual, are attitudes; and one type of attitude shades gradually into another type. And the mind, for Binet, is intelligence: he has now come to define intelligence in terms of attitude.

What else the essay planned for 1912 would have added is hard to guess. It would, of course, have shown how adaptation, direction, and censorship are attitudes; it would probably have tried to describe the content of the attitude in each case. Then also, it might have described how one attitude, *direction*, controls another; or how an attitude becomes more precise, as happens in *adaptation*. The displacement of one attitude by another must also be explained. At any rate, we know that in this system, attitudes would have been the most important psychological ele-

ments; and that adaptation, direction, and censorship are their modes of functioning; and that the more complex states, those commonly called "higher" would have been described in terms of a more refined organization.

The theory would, also, have been shown to have application to the phenomena of the abnormal as well as of the normal. For example, it would have explained why the feeble-minded are adept especially at motor activities, and fail at abstract reasoning: abstract reasoning requires a very finely organized attitude, whereas the feeble-minded are capable only of the more crudely organized attitudes which suffice for manual labor. It would have explained, also, why the intellectual level of the manic-depressive is lowered. The attitude of these individuals is an emotional one, which tends rather toward action, and away from the objective imagery and fine organization required by the intellectual act. By the very nature of things, intellectual and emotional attitudes cannot coexist; where emotion dominates, intellect must suffer.

## CHAPTER V

### CONCLUSION

Binet's earliest contributions to psychology were truly of the 'arm-chair' variety. He apparently found psychology a kind of game, and solved psychological problems by appropriate and clever juggling of the laws of association. It was a matter of finding problems which needed to be solved, and of showing ingenuity in the application of the laws.

The important work which issued from this mode of attack was *La psychologie du raisonnement*. It is a book which assumes that reasoning is nothing but association, and then goes into detail as to the way in which association functions in reasoning. Binet's reasoning is beautifully syllogistic throughout, and more deductive than inductive. His theory of reasoning involves the fusion of similar sensations and images by contiguous association. Various illustrations were given and he had an elaborate inferential proof that the theory was tenable, because apparently image and sensation have the same seat in the brain. The book uses experiment only as the handmaiden of logic; and its contents are altogether opposed to Binet's later writings on the same subject. Yet it is still referred to as one of Binet's important works (see Boring's *History of Experimental Psychology*), but its 'importance' seems now to be such only from an historical standpoint. Actually it has no relation to Binet's later work, except that it may have borne within itself the seed of his subsequent revolt against associationism.

The first signs of this revolt are evident in *Le magnétisme animal*, where Binet admits that it is by straining some facts and overlooking others that one succeeds in explaining all psychology by associationism. It would have been very difficult to combine the laws of association in a way that would explain phenomena observed in hysterical patients and in subjects under hypnosis; for example, the variations which are possible in the way a subject

will carry out a post-hypnotic suggestion, and the spontaneous explanations which he will give for performing this act. The revolt is complete in *Les altérations de la personnalité*, where Binet states positively that there must be laws more fundamental than those of association, since the latter are unable to explain either divisions of consciousness, or the selection by which some memories are retained while others are lost to consciousness.

This repudiation of associationism meant, of course, that Binet was no longer armed to explain the phenomena revealed in an experiment. Consequently he must discontinue to fit the facts to the theory—he had no theory to which to fit them. He began with the observations of his own children, and recorded facts for the interest and suggestiveness which they might have; then gradually he developed theories to fit the facts. Meanwhile, as a result of careful study, he determined what method he thought most appropriate for psychology and most likely to produce reliable results, and what problem seemed to him to require most immediate attention.

The method adopted was that of comparative introspection—really a combination of introspection and elementary statistical procedures. The problem was that of individual differences; for, until psychologists had mastered this subject, there would always be doubt as to the validity of their statements; it would be impossible to know what are the laws of all minds and what laws apply only to peculiar types. The method of comparative introspection was intended to show up the differences due to type, and at the same time bring out the laws which are true for all types.

What Binet meant by introspection was something so broad that it might, at one extreme, have been called intuition: to recognize, for instance, the emotions taking place within another individual might also be called introspection. Many of Binet's observations arise from this intuitive kind of introspection. It was not the reports of observers as to their experiences which led him to say that intelligence must be studied through the complex processes. Although there was some such evidence showing that individuals differ more as to memory than as to sensation, it does not follow directly from this evidence that intelligence is to be

studied through the higher mental processes—for it was not said that intelligence is that, or is correlated with that in which individuals differ most widely. His belief that intelligence is memory, reasoning, judgment, was first stated, indeed (1890) without a shred of supporting evidence; it was based, apparently, on nothing more than observation of this kind.

After 1894 introspection, combined with logic, played a dominant rôle in Binet's researches. In the experiments on memory it led to the discovery of direction. One may cite the experiments with the esthesiometer, in which the introspective reports, coupled with objective data, led to rough outlines of psychological types. In the experiments on the observation of an object, there is a classification of psychological types arrived at by the experimenter's introspecting into the subjects simply by reading their descriptions of the object. *L'Étude expérimentale de l'intelligence*, 1903, was the first attempt to apply objective tests in a series and to utilize the introspective reports made on them in their interpretation. The invention of the scale itself—a process which took many years—naturally involved this method; what is more, it was the authors' intention that introspection should be combined with objective data in the interpretation of results.

This is made clear in the researches consequent upon the invention of the scale, in which the method is used to its best advantage. In forming his *Schéma de la pensée* Binet made use of introspection in its broadest sense—observing the other person, feeling himself into him or her. He put his imbeciles, for example, in situations where they must express a complex thought, even though they had not the vocabulary; they succeeded in expressing this thought in a single word. It is by putting himself into the imbecile's place that Binet is enabled to appreciate the complexity of the thought which is expressed. From the objective datum—the spoken word—and introspective data on the complex nature of this particular thought and on the nature of thought in general, Binet formulated the theory that thought evolves so that at first single words express whole ideas, but as intelligence increases more words are used to express the details of the idea. Similar experiments, tied up with earlier work, showed him that direction,

the evocation of ideas, the repression of incorrect ideas, putting ideas together, are all elements of the thinking process. When he worked with imbeciles and demented, however, he could not ask for their introspective reports; it was he who must experience the efforts they made to follow a train of thought, the difficulties they encountered, the confusion in which they found themselves. So also with insane patients he obtained objective data through the use of the scale and other experiments; but in his interpretations he combined these data with an introspection based largely on his personal observations of the patients.

The application of the method of comparative introspection to the problem of individual differences eventually provided Binet with facts which he might generalize into laws true for psychology as a whole. *Un schéma de la pensée* was a first step in this direction; in *Les idées modernes sur les enfants* Binet indicates one of the purposes of this scheme: to explain the unity of the mind. This problem, of the unity of the mind which is felt by the individual despite the great variety of its functions, the discontinuity which may obtain in memories of past events, the cleavage between concurrent alternating states of consciousness—this unity was something which Binet accepted all along as a given datum, and which he would have liked to explain. In a sense, this problem was involved in the study of intelligence, for to Binet intelligence was coextensive with all that is included in psychology. One begins to see this in the broad definitions in *Alterations of Personality* (p. 350; see above, p. 23); how much is included under the definitions in "Perceptions d'enfants" (above, p. 29). After 1894, when Binet determined to study intelligence, his experiments ran the gamut from experiments on the nature of thought to the measurement of emotions. In the introduction to the 1905 scale he at last candidly stated that intelligence is everything that is included in psychology. That is, intelligence is the whole mind. And after that, Binet proceeded to show that intelligence—the mind—is unitary.

The "elements" of direction, comprehension, invention, censorship, dealt primarily with the more complex functionings of

the mind—memory, reasoning, judgment. They represented a first attempt to make of intelligence something orderly, to show the manner in which it operates. No earlier attempt gave so concise a description of intelligence as something active and organized.

After 1909 the attempt to explain the unity of the mind was accelerated, and by 1911 Binet had announced his intention of publishing a systematic psychology which would explain the mechanism of the mind. Though the system itself was never published, a preliminary article on the nature of emotions and of thought indicates clearly what its general trend would have been. In this article Binet develops his theory from a combination of his own findings with those of other psychologists—particularly with those of the Würzburg school. He succeeded in demonstrating, at least to his own satisfaction, that although muscular activity, emotions, and abstract thought appear altogether heterogeneous, yet they are all manifestations of a single principle: that psychical activity expresses itself in bodily attitudes. If emotion seems to be different from thought, it is not because there is an inherent difference; the difference is simply in the structure and content of the attitude. The same is true for the apparent difference between muscular and other activities. Muscular, emotional, and intellectual attitudes form a graded series in which there is variation of subjective or objective sensations, of consciousness, of muscular set.

It is fair enough to suppose that the next step in drawing up a system of psychology would have been to explain all psychic phenomena in terms of the nature of attitudes and of the laws which govern their functioning. Already in the present article there is the attempt to explain the unconscious as what is left when one takes away the conscious elements of an attitude. Will, or choice, is an experience resulting from the conflict between opposing attitudes. Beyond this Binet would have had, to begin with, to explain how attitudes are responsible for direction, censorship, the invention of combinations in thought. On the other side, where the mind is lacking in integrity—it would have

been necessary to explain the gaps in memory, the incoordinations, the malfunctionings of the ego, the splits of personality, in terms of attitude.

These were problems which Binet had before him in 1911. Together with his technique for reaching the deepest workings of the mind through introspection, which sometimes bordered on intuition, combined with logic, they form the heritage he left to the disciples who would carry on his work.

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